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ENVIRONMENTAL ASSESSMENT PLAN FOR TANK SYSTEM 1489 AND 1508 AIRCRAFT FIREFIGHTING TRAINING FACILITY MILLINGTON SUPPACT TN

6/4/1992

ENSAFE, INC.

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(1)

Environmental Assessment Plan
Tank Systems 1489 and 1508
Aircraft Firefighting Training Facility
Naval Air Station Memphis
Millington, Tennessee

Prepared for:

Department of the Navy
Southern Division
Naval Facilities Engineering Command
Charleston, South Carolina

Contract Number: N62467-89-D-0318

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June 4, 1992

CTO-026

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ACRONYMS AND ABBREVIATIONS

The following list contains many of the acronyms, abbreviations, and units of measure used in this report.

ACGIH	American Council of Governmental and Industrial Hygienists
ADI	Average Daily Intake
ARAR	Applicable or Relevant and Appropriate Requirement
ASTM	American Society of Testing and Materials
BTX	Sum of the Concentrations of Benzene, Toluene, and Total Xylenes in a Sample (UST soil cleanup parameters)
BW	Body Weight
CAG	Carcinogenic Assessment Group
CAP	Corrective Action Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator (Explosimeter)
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLP	USEPA Contract Laboratory Program
CNS	Central Nervous System
COC	Chain of Custody
CPC	Chemical-Protective Clothing
CPR	Cardiopulmonary Resuscitation
CSEP	Confined Space Entry Permit
CV	Coefficient of Variation
DERA	Defense Environmental Restoration Account
DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DP	Duplicate (sample)
DQO	Data Quality Objective

E/A&H	EnSafe/Allen & Hoshall
EAP	Environmental Assessment Plan
EAR	Environmental Assessment Report
EFD	Engineering Field Division
EIC	Engineer-in-Charge
EP	Extraction Procedure/Exposure Period
EPA	United States Environmental Protection Agency
FB	Field Blank
FID	Flame Ionization Detector
GC	Gas Chromatography
GW	Groundwater (sample)
HASP	Health and Safety Plan
HCl	Hydrochloric Acid
HSWA	Hazardous and Solid Waste Amendments of 1984
ID	Internal Diameter
IDLH	Immediately Dangerous to Life and Health
IR	Average Soil Ingestion Rate
LEL	Lower Explosive Limit
LQAC	Laboratory Quality Assurance Coordinator
M^3	Cubic Meter of Air
mg/kg	Milligrams/Kilogram
mg/L	Milligrams/Liter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MSA	Mine Safety Administration
MSDS	Material Safety Data Sheets
msl	Mean Sea Level
MW	Monitoring Well
NAD	North American Datum
NAS	Naval Air Station

NAVFACENGCOM	Naval Facilities Engineering Command
NCP	National Oil and Hazardous Substances Contingency Plan
NCR	NEESA Contract Representative
NEESA	Naval Energy and Environmental Support Activity
NFA	No Further Action
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OVA	Organic Vapor Analyzer
PEL	Permissible Exposure Limit
pH	Negative log of the Hydrogen Ion Concentration
PID	Photoionization Detector
ppb	Parts per Billion
PPE	Personal Protective Equipment
ppm	Parts per Million
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAO	Quality Assurance Officer
QAP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
R	Acceptable Incremental Lifetime Cancer Risk
RB	Rinsate Blank
RCRA	Resource Conservation and Recovery Act
RRF	Relative Response Factor
RSD	Relative Standard Deviation
SB	Soil Boring
SCBA	Self Contained Breathing Apparatus
SG	Soil Gas
SOP	Standard Operating Procedure

SOP/QAM	Standard Operating Procedures and Quality Assurance Manual (USEPA Region IV Environmental Compliance Branch)
SOUTHDIV	Southern Division, Naval Facilities Engineering Command
SOW	Statement of Work
STEL	Short-Term Exposure Limit
SVOC	Semivolatile Organic Compounds
TB	Trip Blank
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment and Conservation
TDS	Total Dissolved Solids
TLV	Threshold Limit Value
TN	Tennessee
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
UEL	Upper Explosive Limit
ug/L	Micrograms/liter
UST	Underground Storage Tank
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compounds

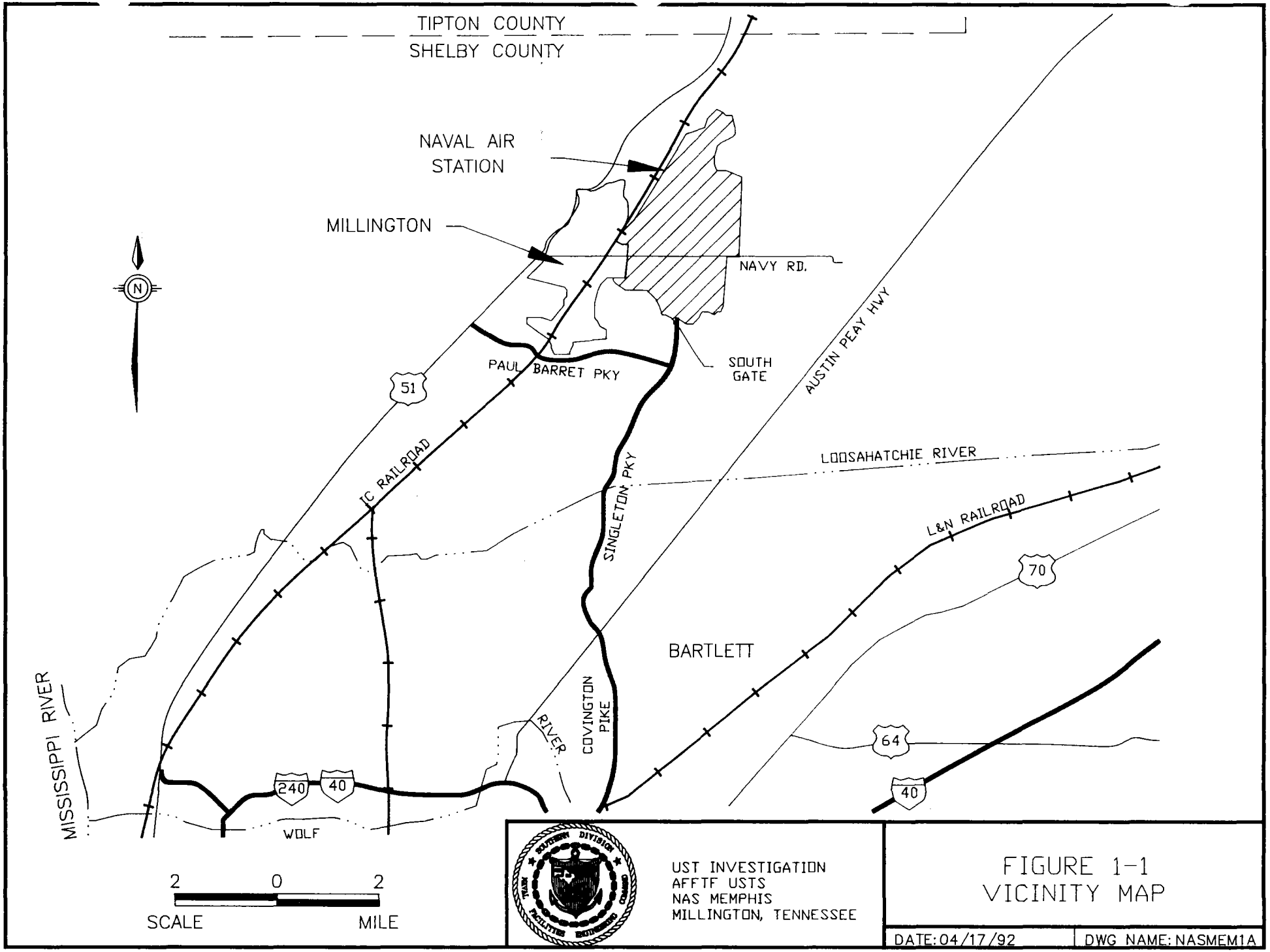
1.0 ENVIRONMENTAL ASSESSMENT PLAN

1.1 Project Objective and Overview

This Environmental Assessment Plan (EAP) outlines the field investigation for assessing the vertical and horizontal extent of contamination, if any, resulting from a release of JP-4 fuel from underground storage tank (UST) systems 1489 and 1508 at the Aircraft Firefighting Training Facility (AFFTF) at Naval Air Station Memphis (NAS Memphis) in Millington, Tennessee (Figure 1-1). The assessment was requested by the Tennessee Department of Environment and Conservation (TDEC), UST Division. The procedures in this EAP are designed to comply with the requirements outlined in the current TDEC UST guidance document dated January 1992, and all pertinent NEESA and EPA requirements.

The objective of this EAP is to assess the vertical and lateral extent of contamination, if any, to the shallow soil zone and water table aquifer resulting from a leak in Tank Systems 1489 and 1508. The EAP is designed to produce data of sufficient technical quality to evaluate the current site conditions and to recommend corrective action as needed.

The EAP, as outlined here, proposes a series of shallow soil borings and conversion of up to eleven borings to shallow monitoring wells. Soil samples will be collected during the completion of all soil borings and groundwater samples will be collected from all completed monitoring wells and at least two existing release detection wells. Samples collected from two borings near each tank system will be analyzed for additional parameters to obtain information needed for a RCRA Facility Investigation (RFI) of the training facility. The RFI samples will be paid for with DERA funds rather than Activity funds, so their analytical costs can be tracked separately. Details of the sampling rationale are discussed in Section 1.4.


TIPTON COUNTY
SHELBY COUNTY
NAVAL AIR STATION
MILLINGTON
NAVY RD.
SOUTH GATE
AUSTIN PEAY HWY
PAUL BARRET PKY
51
IC RAILROAD
SINGLETON PKY
LOOSAHATCHIE RIVER
L&N RAILROAD
70
BARTLETT
MISSISSIPPI RIVER
COVINGTON PIKE
RIVER
240
40
64
40
WOLF
2 0 2
SCALE MILE
UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 1-1
VICINITY MAP
DATE: 04/17/92
DWG NAME: NASMEM1A

1.2 Project Organization

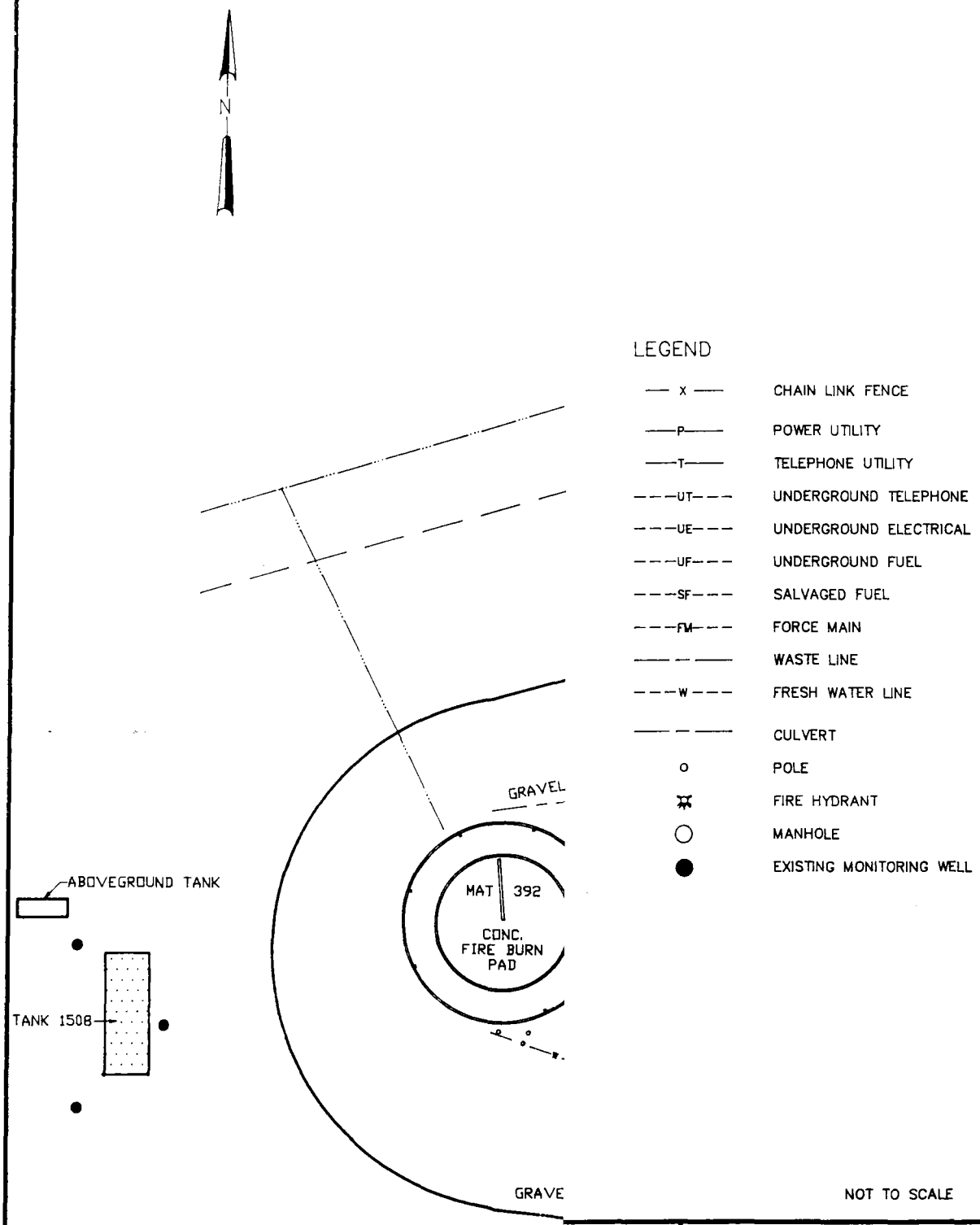
This EAP was prepared by EnSafe/Allen & Hoshall (E/A&H) of Memphis, Tennessee, under contract N62467-89-D-0318 to Southern Division (SOUTHDIV) Naval Facilities Engineering Command, Charleston, South Carolina. Interpretation of field and laboratory data and the development of schedules and revisions will be completed by E/A&H in coordination with the SOUTHDIV Engineer-in-Charge (EIC).

1.3 Site Background

The AFFTF is a facility that has been active since 1949. It consists of east (MAT 305) and west (MAT 392) fire mats on several acres of land in an area designated as Solid Waste Management Unit (SWMU) No. 5 for the upcoming RFI (Figure 1-2). The east mat has three 1,800-gallon USTs for storage of JP-4 fuel, while the west mat has one 5,000-gallon JP-4 UST. A tank tightness test conducted on July 2, 1991 indicated that the west tank and one of the east tanks were leaking. The condition of these tanks was reported to the TDEC on July 3, 1991 and the two tanks were taken out of service. The amount of fuel released is not known.

Waste fuel and water drains from the fire mats to an oil/water separator where the separated JP-4 fuel is pumped back to fire MAT 305 and burned during training exercises. Prior to 1977, the water-fuel-foam mixture from training activities routinely overflowed onsite. There have been several documented releases since 1977, including explosions in drain lines and overflows of the oil/water separator. It is believed that waste oils and solvents were burned with the fuel in the past, therefore it is possible that contaminants other than petroleum may be present (solvents, metals, etc.).

Seven release detection wells were installed adjacent to the tanks in December 1989. Three of these wells are located around the west tank. The other four wells are located at each corner



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NNESSEE

FIGURE 1-2
SITE MAP

DATE: 06/03/92 | DWG NAME: C1

of the tank pit for the three east tanks. According to the logs for these wells (Appendix A), the water table was at approximately 13 feet below ground surface at the time of their installation. The wells have never been sampled. Groundwater flow is believed to be to the southwest.

The two USTs being investigated are scheduled to be removed in the near future under the Navy's Underground Storage Tank program. They could possibly be removed before field work begins. Information obtained during their removal could require changes in the environmental assessment strategy developed for this site.

1.4 Sample Rationale

The scope of work for this project includes the installation of up to 20 shallow soil borings; up to 11 will be completed as shallow groundwater monitoring wells. Boring locations will be placed to define the lateral and vertical extent of contamination. The sampling rationale is designed to comply with current TDEC UST Division guidelines for impementing an EAP.

The rationale for the placement of the first four soil borings and monitoring wells is dictated by State guidelines. The first four borings around each tank area must be completed as monitoring wells. The first boring (B1/MW1) must be installed in what is believed to be the upgradient direction from the release. The second and third borings (B2/MW2 and B3/MW3) must be installed in what is believed to be the downgradient direction from the release. The fourth boring (B4/MW4) must be installed as close as possible to the location of the release. A fifth boring/well is required in the tank backfill if the tank is still in place and is believed to be the source of contamination. An existing release detection well will serve this purpose.

Additional boring and well locations will be based on field data to best determine the extent of the contaminant plume, if one is indicated. Criteria for selecting these additional boring

locations include soil gas survey data, headspace data, visual or other observations, and the experience of the project geologist. Additional samples collected from two borings/wells near each tank system will be analyzed for parameters needed for an RFI of the training facility.

Before any field activities are conducted, site access must be arranged with Mrs. Tonya Barker (901/873-5209) of the NAS Memphis Public Works Office. A drilling permit will have to be obtained and all utilities will need to be marked by NAS Memphis personnel. These tasks should also be coordinated through Mrs. Barker.

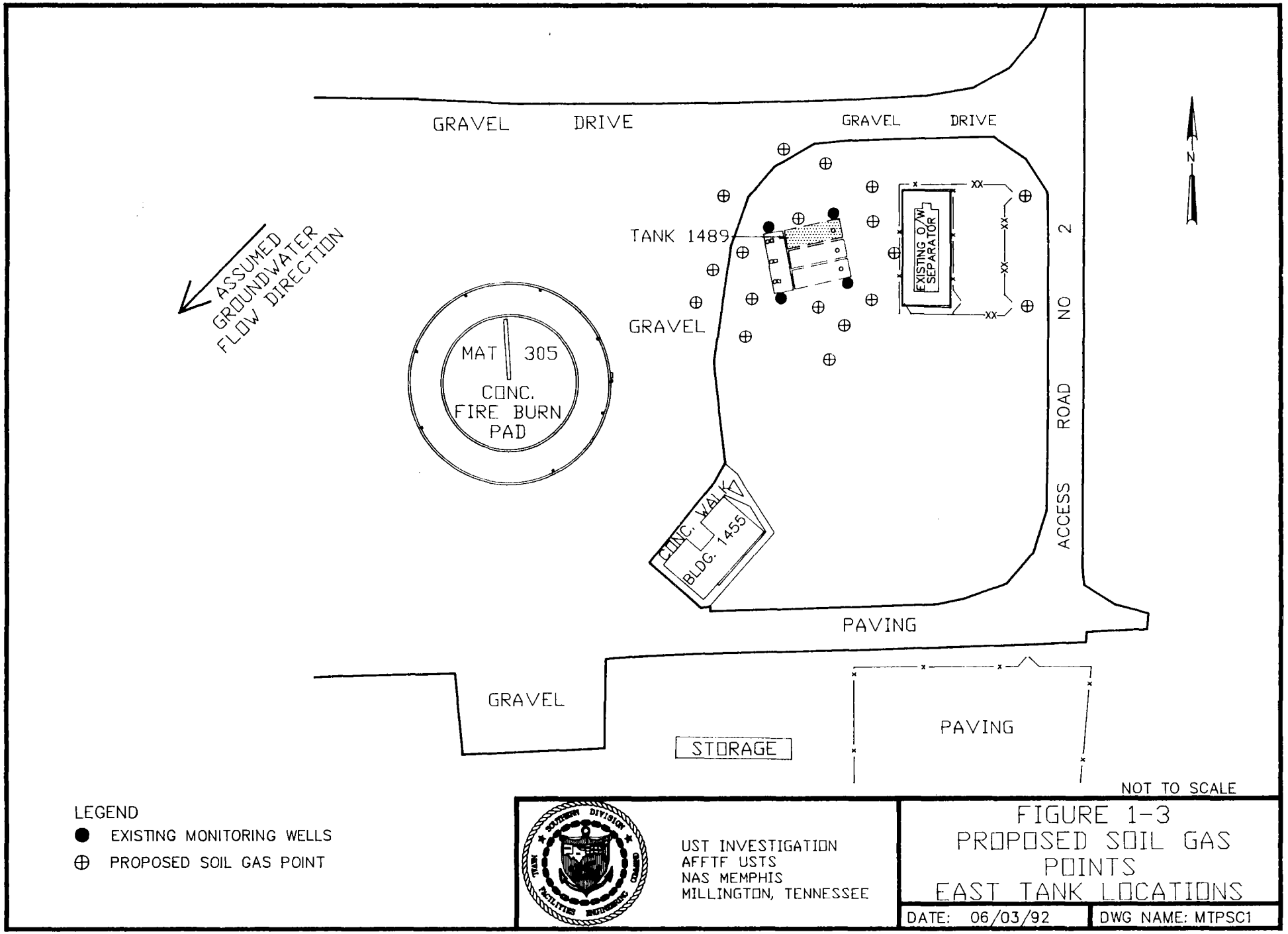
1.5 Soil Gas Survey

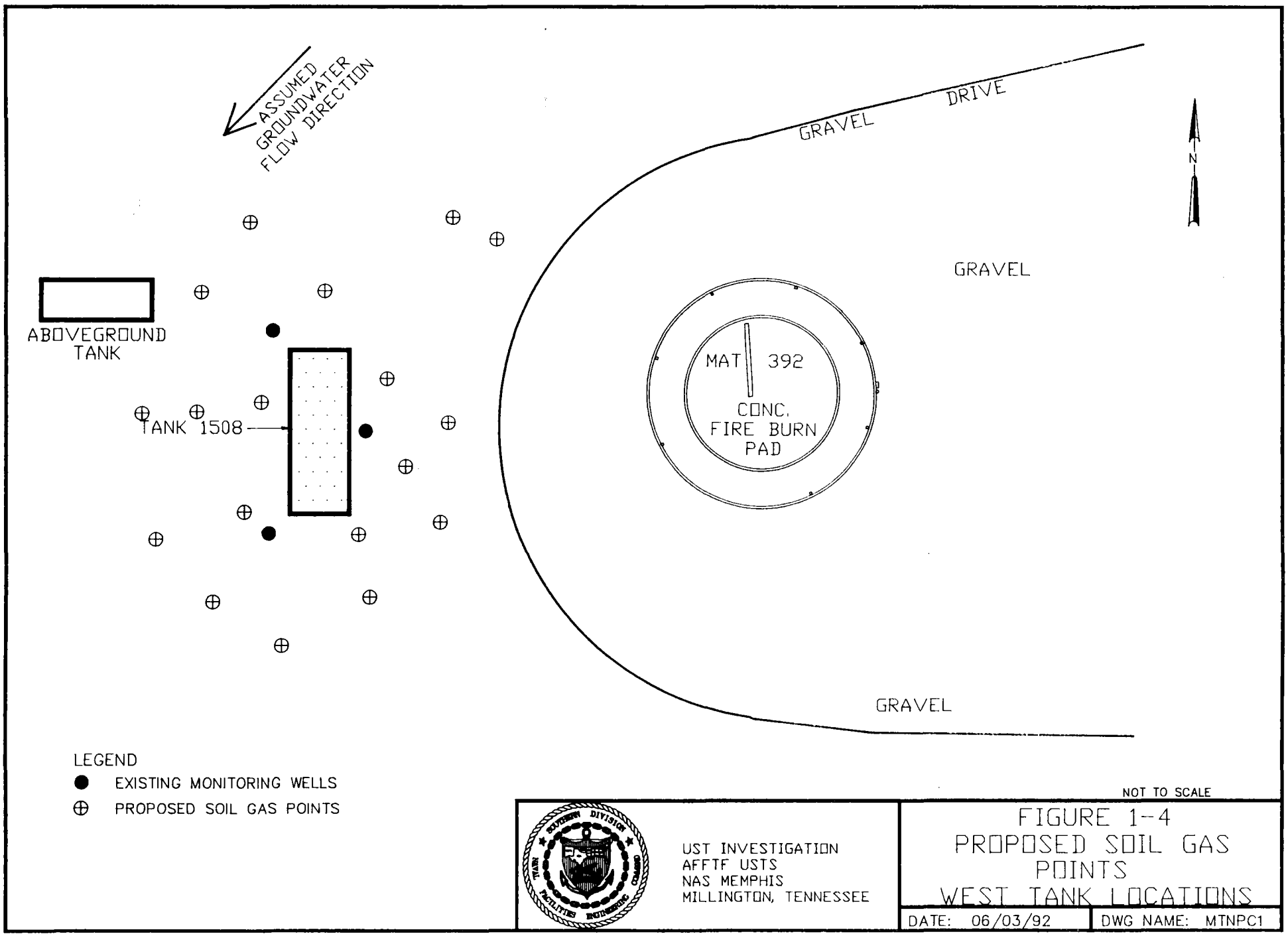
A soil gas survey consisting of 36 total drive points will be conducted to aid in determining the nature and extent of possible contamination. Eighteen drive points extending to a maximum depth of 20 feet will be utilized in the vicinity of each tank to meet these objectives. (Figures 1-3 and 1-4) Results of the soil gas survey will aid in the final placement of monitoring wells.

The preferred soil gas survey technique for this site will use a hydraulic probe to reach the sampling depth desired. The sampling probe will be pushed by a truck-mounted hydraulic press to the proper sampling depth (approximately 12.5 feet). Soil gas will be extracted by applying a vacuum through the probe and collecting the gases in a sample collection container. The sample will be analyzed onsite for volatile organic compounds using a portable gas chromatograph.

1.6 Soil Borings

Twelve soil borings are proposed for the investigation of the east tank and eight borings for the west tank. Auger spoils will be containerized in 55-gallon drums for disposal by NAS Memphis. A sample of the containerized soil from each tank area will be analyzed to facilitate proper


GRAVEL
DRIVE
GRAVEL
DRIVE
N
ASSUMED GROUNDWATER FLOW DIRECTION
TANK 1489
EXISTING O/W SEPARATOR
GRAVEL
MAT 305
CONC. FIRE BURN PAD
ACCESS ROAD NO 2
CONC. WALK
BLDG. 1455
PAVING
GRAVEL
STORAGE
PAVING
NOT TO SCALE
LEGEND
EXISTING MONITORING WELLS
PROPOSED SOIL GAS POINT
UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 1-3
PROPOSED SOIL GAS POINTS
EAST TANK LOCATIONS
DATE: 06/03/92
DWG NAME: MTPSC1


ASSUMED GROUNDWATER FLOW DIRECTION
GRAVEL DRIVE
N
GRAVEL
ABOVEGROUND TANK
TANK 1508
MAT 392
CONC. FIRE BURN PAD
GRAVEL
LEGEND
EXISTING MONITORING WELLS
PROPOSED SOIL GAS POINTS
NOT TO SCALE
UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 1-4
PROPOSED SOIL GAS POINTS
WEST TANK LOCATIONS
DATE: 06/03/92
DWG NAME: MTNPC1

disposal. Figures 1-5 and 1-6 are site plans indicating the proposed boring locations. Soil borings will be installed using 4.25-inch interior diameter (ID) hollow-stem augers. Borings will be advanced to the top of the water table. Borings to be completed as shallow monitoring wells will be completed to 7 feet below the water table. All soil samples will be collected in accordance with *SOUTHDIV Guidelines for Groundwater Monitoring Well Installation* and NEESA 20.2-031A, Chapter 4.

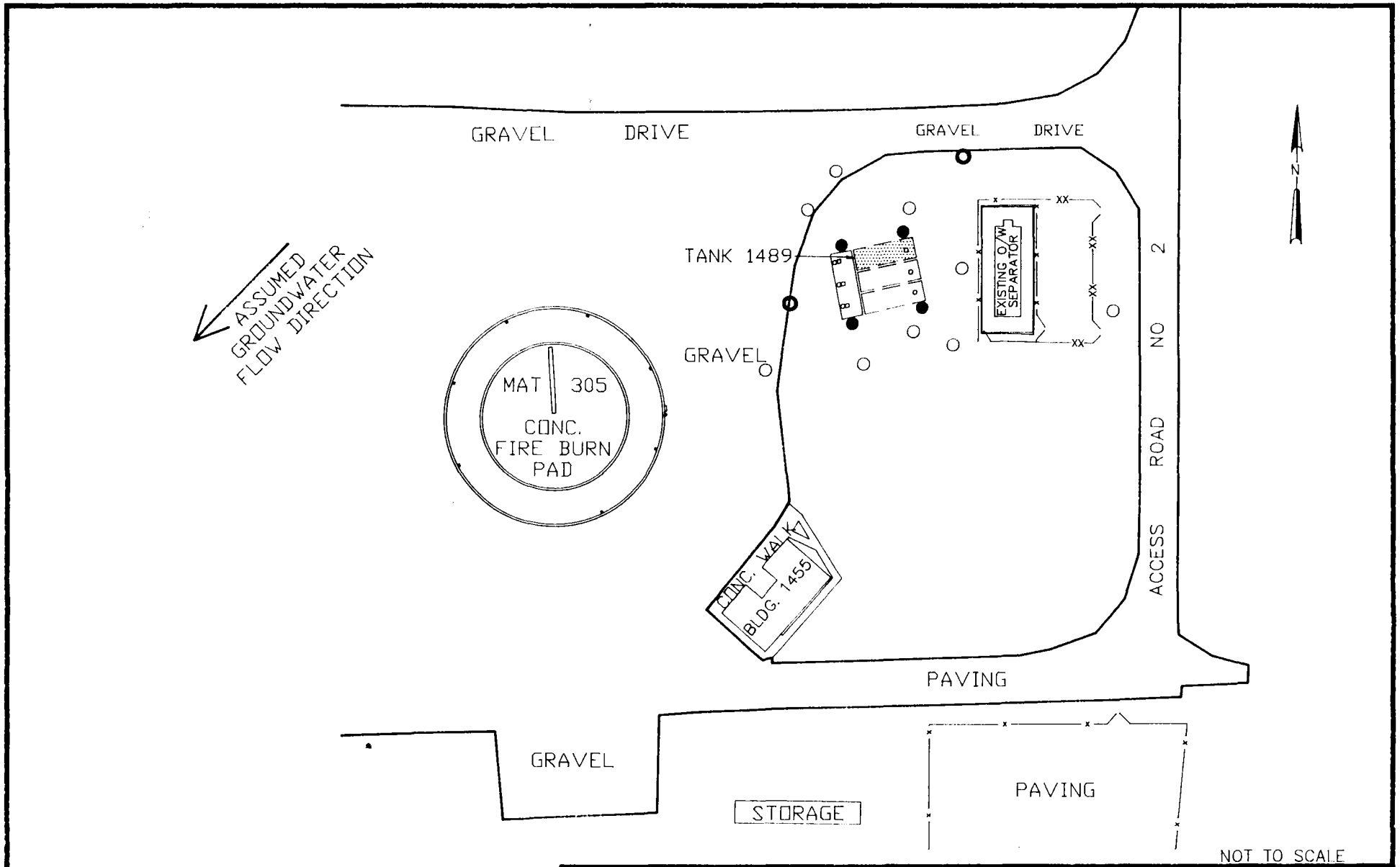
To obtain information useful for the RFI while investigating the USTs, extra samples from two of the borings near the east tank and two of the borings near the west tank will be collected and analyzed for additional parameters.

1.6.1 Soil Sampling Procedures

Soil samples will be collected using a CME continuous sampler through the annulus of the augers during the completion of each boring. Soil samples will be collected continuously from the surface to the terminating depth of each boring. Below 20 feet, soil samples will be collected at 5-foot intervals. The last soil sample to be collected for analysis will be at the top of the saturated zone. One to three soil samples will be selected from each boring for laboratory analysis based on field screening. Soil boring logs (Figure 1-7) will be prepared for each boring advanced beyond a depth of 5 feet.

1.6.2 Laboratory Sample Selection Criteria

The TDEC requires that one sample be collected and analyzed from the point of highest contamination as determined by field screening (e.g., headspace analysis with OVD). Screening will be accomplished by splitting each soil sample into two samples. The first subsample will be placed in the appropriate containers for possible laboratory analysis.


GRAVEL
DRIVE
GRAVEL
DRIVE
ASSUMED GROUNDWATER FLOW DIRECTION
TANK 1489
EXISTING O/W SEPARATOR
XX
XX
XX
XX
GRAVEL
MAT
305
CONC. FIRE BURN PAD
CONC. WALK
BLDG. 1455
ACCESS ROAD NO 2
PAVING
GRAVEL
STORAGE
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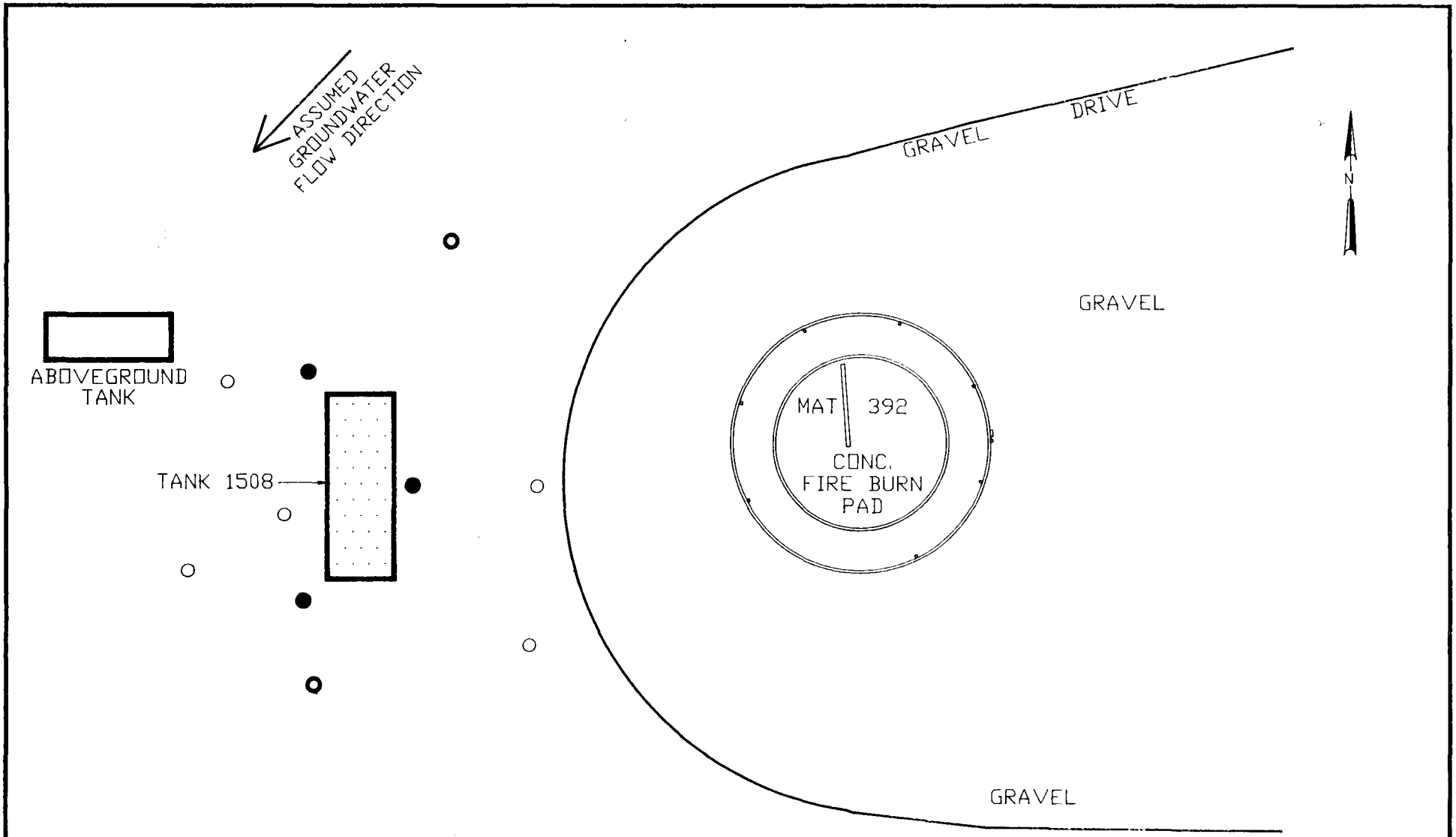
NOT TO SCALE
LEGEND
EXISTING MONITORING WELLS
PROPOSED SOIL BORING
PROPOSED SOIL BORING – DERA ANALYSES
UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 1-5
PROPOSED SOIL BORINGS
EAST TANK LOCATIONS
DATE: 06/03/92
DWG NAME: MTPSC1



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UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 1-6
PROPOSED SOIL BORINGS
WEST TANK LOCATIONS

DATE: 06/03/92

DWG NAME: MTNPC1

LOCATION OF BORING

JOB NO.	CLIENT	LOCATION

DRILLING METHOD:

BORING NO.

SHEET

OF

SAMPLING METHOD:

DRILLING

	START	FINISH
WATER LEVEL	TIME	TIME
TIME		
DATE	DATE	DATE
CASING DEPTH		

DATUM

ELEVATION

DRILLING CONTR

BY

DATE

CHK BY

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT SAMPLER	VAPOR CONCENTRATIONS OPM	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 1-7
SOIL BORING LOG

DATE: 04/17/92

DWG NAME: CLENBORL

The second subsample will be placed in an air-tight container leaving some headspace. Each sample will be allowed a minimum volatilization time of 15 minutes at a minimum of 68°F. All samples should be allowed to volatilize for an equal period of time prior to screening. Afterwards, total organic vapors in the headspace will be measured with an OVD. The OVD will either be a photoionization detector or a flame ionization detector.

If the OVD reading and other field screening (e.g., visual observation) indicate that contamination does not exist in the soil at a boring location, then the deepest sample collected will be submitted for laboratory analysis. This may be the sample collected immediately above the water table or at the bottom of the boring, whichever occurs first. If OVD readings indicate that contamination does not exist but visual or other observation indicates otherwise, then two samples will be selected for laboratory analysis. The first sample submitted is the one that indicates the highest level of contamination based on field screening data. The second sample submitted is the one collected above the water table or at the bottom of the boring, whichever is shallower. If one sample meets both of these criteria, then only that sample is required for laboratory analysis.

If the OVD reading indicates that contamination is present in the soil at a boring location, then three soil samples from that boring must be submitted for laboratory analysis. In accordance with TDEC guidance, the samples selected for analysis will be: (1) from where the OVD screening indicated the highest level of contamination (2) the deepest sample in which the OVD screening indicated contamination and, (3) the sample collected from either immediately above the soil/bedrock interface, the water table, or the bottom of the boring, whichever came first. If one soil sample meets more than one of the criteria listed above, then the sample with the second highest OVD reading shall also be submitted for laboratory analysis.

The sampling process is discussed in more detail in the Region IV Environmental Compliance Branch *Standard Operating Procedures and Quality Assurance Manual (SOP/QAM) (February 1991)*. The selected samples will then be cooled in an ice chest to 4°C (± 2°C) and shipped under chain-of-custody via overnight courier to the selected laboratory for analysis.

1.6.3 Determining Soil Permeability

Two undisturbed soil samples (Shelby tubes) will be collected in the unsaturated zone and within or below the zone of suspected soil contamination. These samples will be collected immediately adjacent to the fourth boring. The first Shelby tube will be collected at the depth that is believed to represent the zone of highest permeability based on the samples obtained from the fourth boring. The second Shelby tube will be collected immediately above the water table. If one soil sample meets both of these criteria, then the second Shelby tube will be taken at the depth where the second highest permeability would be expected. If there is no evidence of contamination in the fourth boring, then the samples should be collected where the highest permeability would be expected. The sample with the highest permeability will govern the stringency of cleanup levels.

The thin-walled tube sampling method (ASTM Method D1587) shall be utilized to collect the samples. The permeabilities shall be determined using the Triaxial Cell or Pressure Chamber Permeameter Methods, as described in Method 9100 of *Test Methods for Evaluating Solid Waste, Third Edition (SW-846)*.

1.6.4 Decontamination Procedures

During all phases of drilling, the augers and other downhole equipment will be steam cleaned with a laboratory-grade detergent wash and a potable water rinse, before and after each soil boring. Sampling tools will be high pressure steam cleaned with a laboratory-grade detergent

wash followed by a potable water rinse, followed by a final deionized or distilled water rinse. Latex surgical gloves will be changed after each sample is collected to further ensure that cross-contamination does not occur.

Sampling equipment for borings that RFI parameters will be collected from will have an isopropanol rinse and a deionized/organic-free water rinse following the potable water rinse.

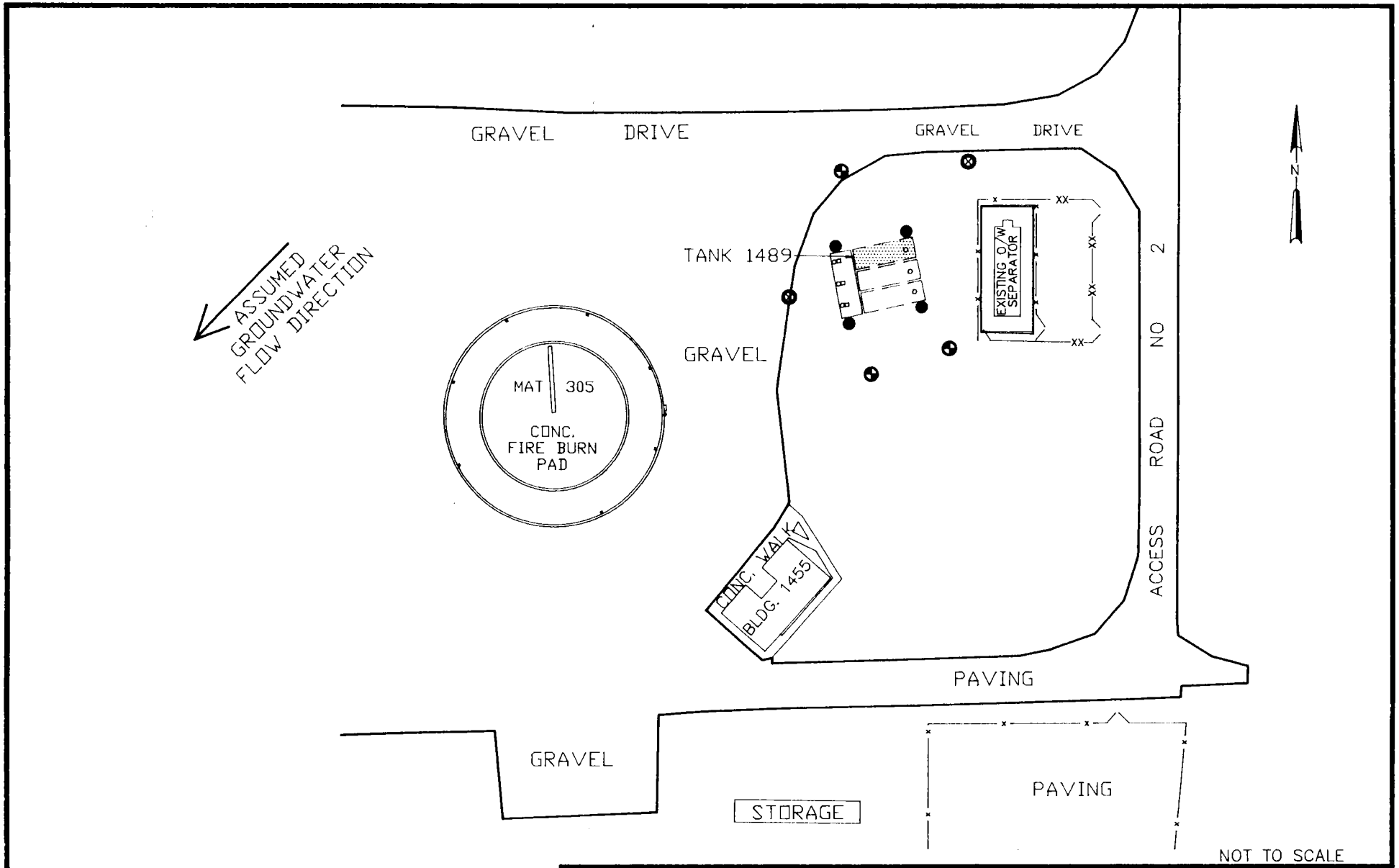
1.7 Monitoring Wells

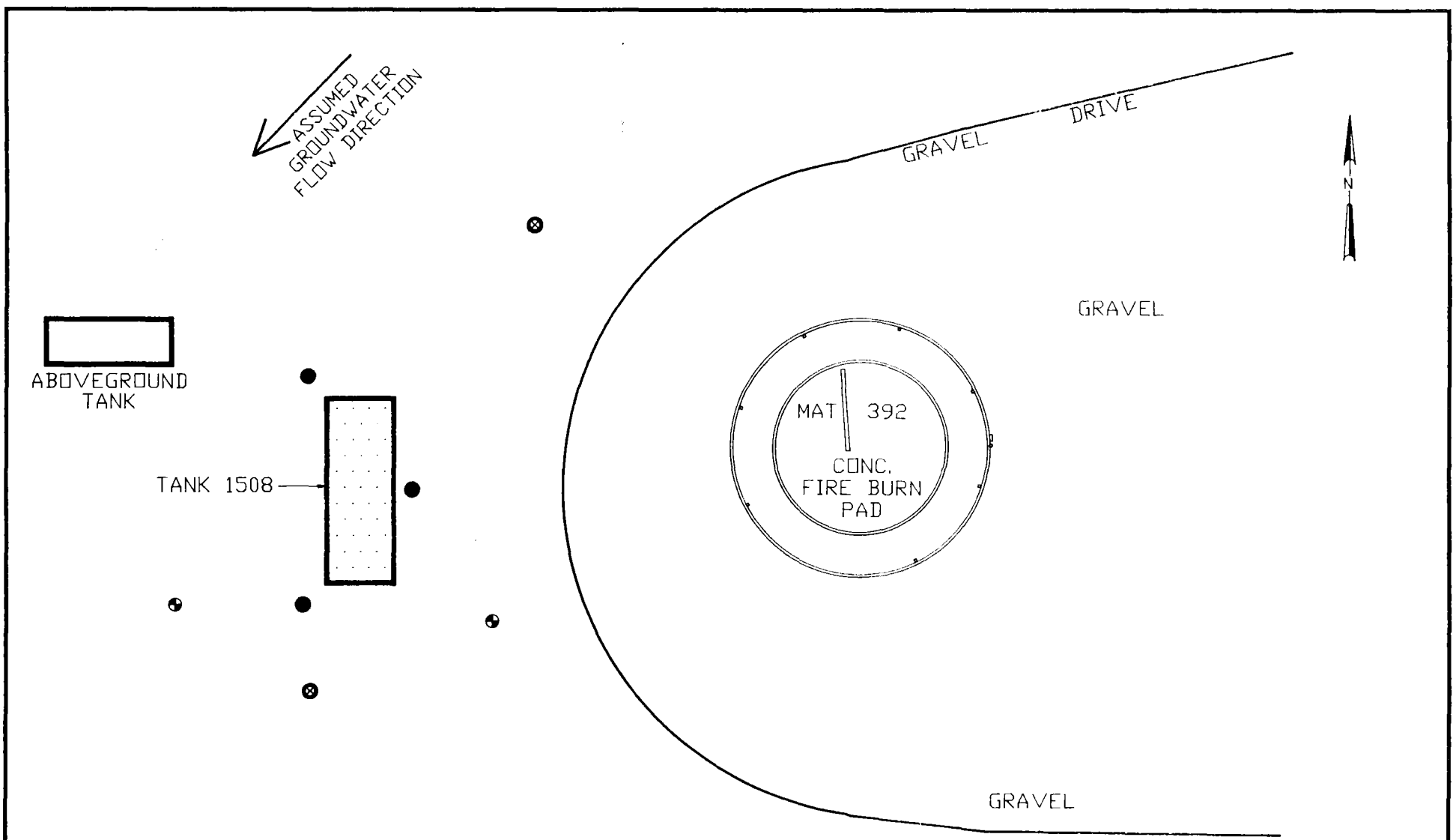
1.7.1 Monitoring Well Installation

There are seven existing release detection wells at the site. The east tank has four wells, while the west tank has three wells in its immediate vicinity. The logs for these wells are included as Appendix A. If possible, one existing well near each tank will be used as the well TDEC requires in the tank backfill. Initially, the state-mandated minimum of four monitoring wells will be installed around each tank area (east and west). If groundwater sampling results indicate that more wells are needed to define the extent of contamination, the other budgeted wells will be installed.

Figures 1-8 and 1-9 show the proposed locations of the initial monitoring wells. Each well will be logged by a qualified field geologist during sampling. Monitoring well borings will be initiated using 4.25-inch ID hollow-stem augers. The boring will then be overdrilled using 6.25-inch hollow-stem augers. All wells will be installed through 6.25-inch hollow-stem augers unless special conditions require alteration of this procedure.

Each well will be constructed using a 10-foot section of 2-inch diameter, 0.01-inch slot, PVC screen attached to 2-inch diameter, Schedule 40 PVC riser. A 10-foot screen positioned 3 feet


GRAVEL
DRIVE
GRAVEL
DRIVE
ASSUMED GROUNDWATER FLOW DIRECTION
TANK 1489
EXISTING O/W SEPARATOR
XX
XX
XX
XX
GRAVEL
MAT 305
CONC. FIRE BURN PAD
CONC. WALK
BLDG. 1455
ACCESS ROAD NO 2
PAVING
GRAVEL
STORAGE
PAVING
N
NOT TO SCALE
LEGEND
EXISTING MONITORING WELLS
PROPOSED MONITORING WELL
PROPOSED MONITORING WELL – DERA ANALYSES
SOUTHERN DIVISION
NAVY
FACILITIES ENGINEERING COMMAND
UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 1-8
PROPOSED MONITORING WELLS
EAST TANK LOCATIONS
DATE: 06/03/92
DWG NAME: MTPSC1



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UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 1-9
PROPOSED MONITORING WELLS
WEST TANK LOCATIONS

DATE: 06/03/92

DWG NAME: MTNPC1

above and 7 feet below the top of the water table will ensure adequate screening of "floater" contaminants, while allowing for temporal fluctuations in the water table. If an underlying aquitard is reached prior to a depth of 7 feet below the water table, drilling will be terminated to maintain the integrity of the aquifer. If such an aquitard is encountered at a depth of 2 feet or less below the water table, a 5-foot screen will be used. The 5-foot screen will allow for monitoring of the entire water-bearing unit and an additional 3 feet of screen above the water table.

A filter pack of clean 20/40 silica sand will be tremied through the annulus of the hollow-stem augers to a depth of not more than 2 feet above the top of the screen with at least 6 inches at the bottom of the boring to support the well casing. The sand is intended to prevent clogging of the screen slots by aquifer material.

A bentonite seal (bentonite pellets hydrated with distilled water) will be installed on top of the sand pack to prevent infiltration of surface water down the outside of the well casing. This seal will be tremied to 2 feet above the filter pack. After allowing the bentonite seal to cure at least 12 hours, the remaining annulus of the borehole will be grouted to within 2 feet of the surface. The annular grout will consist of a mixture of Portland cement and 4 to 6 percent powdered bentonite. During introduction of the sand pack and the bentonite seal, accurate measurements ($\pm$ 0.2 feet) will be made to the top of the pack and the seal with a weighted measuring tape or the tremie pipe itself. The final 2 feet of the annular space will be filled with concrete.

To facilitate groundwater monitoring procedures and protect the integrity of the wells in unpaved areas, approximately 2.5 feet of stickup will be left above the ground surface at each monitoring well site. A 4'x4'x6" outwardly sloping concrete pad will surround the ground surface of each well casing. A 4-inch diameter steel post will be placed at each corner of the pad to protect the

well. A steel casing with a locking cap will also be installed to preserve the integrity of the well. Wells in paved or high traffic areas will be finished at ground level, capped with a locking cap, and secured by a flush-mount (manhole style) protective covering. Figure 1-10 is a suggested schematic for the monitoring wells to be installed.

All monitoring wells will be surveyed by a State of Tennessee Registered Land Surveyor to the nearest 0.01 foot (vertically), incorporating USGS NAD '27 (horizontally). A permanent mark will be located at the top of each well casing to aid in generating accurate and consistent groundwater elevation data. After the wells are properly developed and surveyed, water level measurements will be recorded to determine groundwater flow direction, groundwater elevation in relation to mean sea level (msl), and to construct a potentiometric surface diagram for the area of investigation.

1.7.2 Monitoring Well Development

The grout will be allowed to cure for at least 24 hours following completion before development will begin. Wells will be developed by hand bailing, surge block, pumping or a combination of any of the above. Development will continue until groundwater is free of sediment, and turbidity is at a minimum. Each well will then remain undisturbed for at least 24 hours to allow the natural conditions in the aquifer to equilibrate after the disturbance caused by well installation and development.

Monitoring well installation notes, calculations, descriptions, and observations will be recorded in the project field logbook. Well construction logs will be produced depicting components of the finished monitoring wells (e.g., total depth, depth to water, depth of filter pack, thickness of bentonite seal).

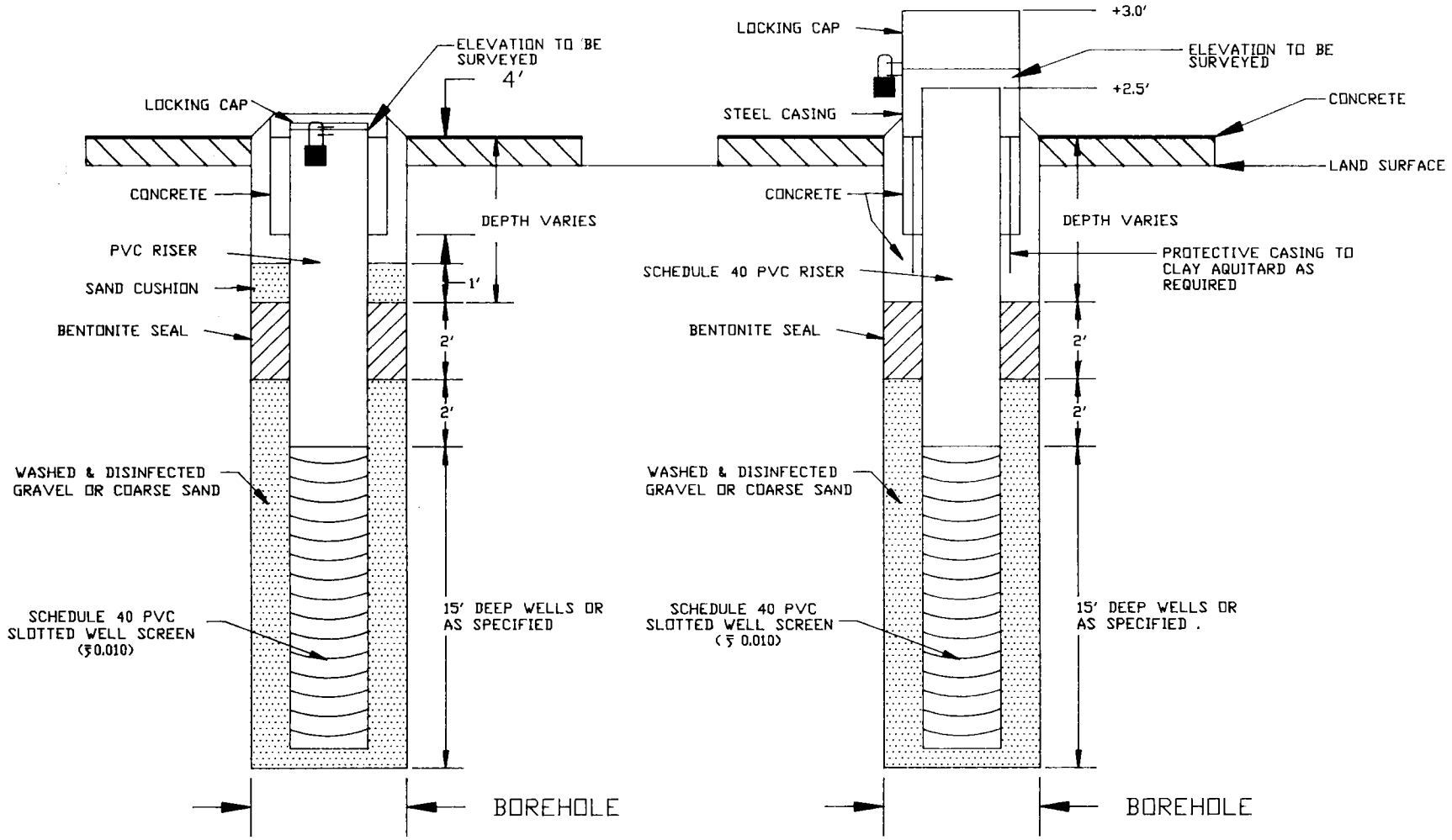

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FIGURE 1-10
MONITORING WELL SCHEMATIC

DATE: 04/17/92 | DWG NAME: KTWELL

1.7.3 Monitoring Well Sampling Procedures

Sampling of the monitoring wells will involve reading the static water level to calculate well casing volume, purging the well casing of stagnated water, retrieving the sample and placing it into properly labeled sample container(s). These procedures are described below.

1.7.3.1 Static Water Level Measurement

Static water level measurements will be performed on all monitoring wells prior to purging and in accordance with NEESA 20.2-031A and the *Southern Division Specifications for Groundwater Monitoring Well Installation and Sampling*.

The procedure is as follows:

- The water level meter will be tested prior to use to ensure proper operation.
- The probe will be decontaminated prior to each measurement with a deionized or distilled water rinse.
- The probe will be lowered into the annulus of the monitoring well until the buzzer indicates the probe has intersected the groundwater surface.
- The depth to water will be measured to the nearest 0.01 foot relative to the permanent mark established at the wellhead. The depth to water will be recorded in the bound field logbook and the date and time will be noted.

1.7.3.2 Monitoring Well Purging

Each well will be purged of stagnant water immediately before sampling. The purging process ensures that the well is functioning properly and that representative groundwater samples are obtained. During well purging, select water quality measurements will be collected, including pH, temperature, and specific conductance (conductivity). Oxidation-reduction potential and/or turbidity may also be measured.

Well purging procedures will be in accordance with NEESA 20.2-031A. These procedures are outlined below:

- At least three casing volumes will be purged from each well. The water volume in the well casing will be calculated before purging by subtracting the depth to water from the total depth of the casing and multiplying by the appropriate factor (0.163 gallons per foot for a standard 2-inch PVC well casing).
- Well purging may be completed by bailing or pumping. Bailing will be conducted with a PVC or Teflon, single-check valve bailer which is manually lowered into the well, filled with water and then retrieved. Pumping may be completed with a hand pump or an electrical submersible pump.
- If a well bails to dryness before an adequate purge volume is removed, the volume removed will be noted and an explanation will be given. The well will be sampled as soon as possible after recovery.

1.7.3.3 Sample Collection

Groundwater samples will be collected in accordance with NEESA 20.2-031A, Chapter 7 - Ground-Water Sampling and *Southern Division Specifications for Groundwater Monitoring Well Installation and Sampling*. Monitoring wells will not be sampled if 0.01 foot or more of free product is encountered. Groundwater samples will be collected using dedicated or disposable PVC single-check valve bailers and nylon bailing rope. Wells that are to be sampled for RFI parameters will have dedicated or disposable Teflon bailers with Teflon leaders.

Sampling procedures are as follows:

- A sheet of clean plastic will be placed on the concrete platform and around the security casing to prevent possible contact between the bailer and bailer rope with the ground surface.

- The bailer will be slowly lowered into the water column to minimize water column disturbance.
- After the bailer has filled with water, it will be manually retrieved and the samples will be immediately transferred to appropriate sample containers.
- While in the field and during transport to the laboratory, all samples will be retained in a field cooler with ice packs.

1.7.4 Groundwater Sampling Equipment Decontamination

Equipment used in measuring and sampling groundwater monitoring wells will be decontaminated in accordance with *Southern Division Guidelines for Groundwater Monitoring Well Installation*, Part 3.5 and NEESA 20.2-031A, Chapter 3.3. Before site activities begin, it will be necessary for all bailers and the water level indicator to be decontaminated using a laboratory-grade detergent wash, followed by a triple distilled water rinse, and allowed to air dry. Measurement equipment will be decontaminated in the same manner between samples. This procedure will be followed to minimize the potential for cross-contamination of samples between sampling locations. Sampling equipment for wells from which RFI parameters will be collected will have an isopropanol and deionized/organic-free water rinse following the potable water rinse. Latex disposable gloves will be worn during all measurement and sampling activities. A new pair of disposable gloves will be donned for each water sample and/or measurement.

1.7.5 Groundwater Classification To Determine Cleanup Levels

Should groundwater contamination be detected, it will be necessary to classify the groundwater as "drinking water" or "non-drinking water" in order to determine the applicable TDEC cleanup level. The groundwater classification procedure is a three-step process which must be performed in sequence. It provides information on use, water quality, and yield of the affected aquifer or

water supply. If at any point during the classification procedure the aquifer is classified as a drinking water supply, no further steps shall be completed.

Groundwater Classification Procedures:

Water Use Survey — A water use survey is conducted in the area around the UST site. The area to be surveyed is based on the direction of groundwater flow and the geologic characteristics of the affected area. Field surveys, personal contacts, and a records search are performed as part of the survey. If the affected aquifer or water supply is being used by the citizens of the state, the water source shall be classified as a "drinking water supply."

Analytical Sampling — If the water source is not classified as a drinking water supply by the water use survey, a water sample from the monitoring well upgradient of the location of the leak is analyzed for the primary and secondary drinking water standards of TDEC rule 1200-5-1. If the water fails to meet any of the primary or secondary standards, it may be classified as a "non-drinking water supply." Failure to meet the primary or secondary standards cannot be the result of petroleum contamination, unless naturally occurring.

Pump Test — If the groundwater meets the primary and secondary drinking water standards, the yield of the aquifer or water supply shall be determined. According to TDEC guidance, "a suitable pump test method shall be used to determine if the affected aquifer or water source is capable of providing a yield of at least one-half gallon per minute." All monitoring wells shall be tested until all wells have been tested or one well yields at least one-half gallon per minute. If the affected aquifer is not able to produce

water at the rate of one-half gallon per minute, it may be classified as a "non-drinking water supply."

TPH cleanup levels are 0.100 ppm for drinking water and 1.000 ppm for non-drinking water. Hydraulic parameters other than yield will be needed to properly design a remediation system. A proper method for defining these hydraulic parameters will be determined based on the permeability data acquired during falling head analysis of Shelby tube samples. Possible test methods include slug test(s), pumping test(s), and/or additional Shelby tube analysis.

1.8 Sample Documentation

Pre-cleaned sample containers will be provided by the laboratory which must be both NEESA and state-approved. The laboratory must follow NEESA 20.2-047B, Chapter 3.5 -Sample Container Cleaning Procedures (and/or other applicable protocol). The containers will remain in the custody of E/A&H personnel. Soil samples to be collected for Gasoline Range Organics Method TPH analyses will be collected in 250 ml. (or 8 oz.) glass jars with Teflon-lined septum lids. Soil samples collected for BTX analyses will be collected in 125 ml (or 4 oz.) glass jars with Teflon-lined lids. Water samples for Gasoline Range Organics Method TPH will be collected in 40 ml amber glass vials with Teflon-lined septa. Water samples for BTX analyses will also be collected in 40 ml. glass vials with Teflon septa. While in the field and during transport to the laboratory, all samples will be retained in a field cooler with ice packs to maintain sample temperature at approximately 4° C (± 2° C). BTX water samples will be preserved with 4 drops of 1:1 HCL to reduce pH levels below 2. TPH water samples will be preserved with 200 uL of 50 percent HCL. Proper acidification will be verified using litmus paper or a portable pH meter. Holding times for TPH (soil and water) shall not exceed 28 days prior to analyses. Holding times for BTX (soil and water) shall not exceed 14 days prior to analyses.

DERA-funded samples for the RFI will be analyzed for volatile organic compounds (CLP), semivolatile organic compounds (CLP), PCB/pesticides (8080), RCRA Appendix IX total metals (6010/7000 series), and TPH. Sample containers and preservatives for these parameters are described in Section 2.8 of the Quality Assurance Plan.

Each sample will be identified by a sample label as shown in Figure 1-11. When sample containers are filled at the site, the proper forms will be completed, and the samples prepared and shipped to the laboratory.

1.8.1 Sample Chain-of-Custody

E/A&H will follow chain-of-custody procedures in accordance with NEESA 20.2-047B, Chapter 3.8, and corporate Standard Operating Procedures for chain-of-custody. E/A&H will use chain-of-custody (COC) forms, such as the one illustrated in Figure 1-12, for transferring sample shipments to the laboratory. Documentation of all samples will also be kept in the project field logbook.

Upon transfer of custody, the chain-of-custody form will be signed by the E/A&H field sampling team leader, including the date and time the samples were relinquished. Because common carriers will not sign chain-of-custody forms, the chain-of-custody records will be sealed within each shipping container. All chain-of-custody forms received by the laboratory must be signed and dated by the laboratory sample custodian and returned to E/A&H following receipt or as part of the data reporting package. The common carrier package bill number will be documented on the COC and in the field logbook. **RFI samples will be shipped under separate chain-of-custody so their cost can be tracked separately and paid for with DERA funds.**

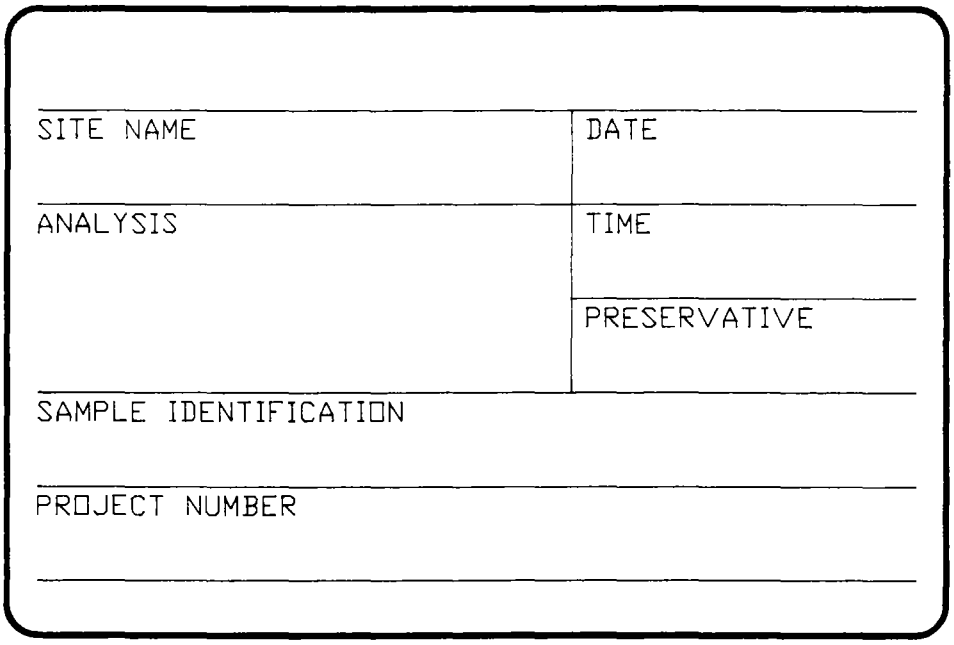

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FIGURE 1-11
SAMPLE CONTAINER LABEL

DATE: 04/17/92 | DWG NAME: CLNSBL

FIGURE 1-12
CHAIN OF CUSTODY RECORD

LABORATORY: _____

ATTENTION: _____

PROJECT NO.: _____

PAGE___ of____

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CLIENT NAME / COLLECTED BY							#of containers	MEDIA (X)				SAMPLE ANALYSIS (X)									REMARKS
SAMPLE ID	DATE	TIME	comp	grab	well	SAMPLE LOCATION		SOIL	WATER	SEDIMENT	GROUNDWATER										

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:

RELINQUISHED BY:	DATE	TIME	RECEIVED AT LAB BY:	DATE	TIME	REMARKS

CLENCUS1

1.8.2 Field Activity Documentation

Field documentation will be employed by sampling personnel detailing relevant information collected during the investigation. Field notes will include such pertinent information as date, time, weather conditions, locations of sample points, problems encountered, deviations from the sampling plan, names of personnel. Photos may be taken of each sample location during collection and logged for future reference.

1.9 Analytical Procedures

This EAP will follow the analytical procedures described below.

1.9.1 Field Analyses

Soil sample screening will be performed as outlined in Section 1.6.2 of this EAP. Static water level measurements will be performed on all monitoring wells subsequent to well development with adequate time allowed for well recharge. In addition, pH, temperature, and conductivity, will be measured in the field for each water sample collected. Oxidation-reduction potential and/or turbidity of water samples may also be measured. Field measurements will be recorded in a dedicated field logbook and/or appropriate E/A&H field activity log (e.g., boring log, well construction log).

1.9.2 Laboratory Analyses

NEESA Level C (EPA Level 3) quality assurance (QC) shall be used for field sampling and laboratory analysis as outlined in the Quality Assurance Plan (QAP) and NEESA 20.2-047B. Sample analyses will be performed in accordance with NEESA 20.2-047B, Chapter 7. Soil and groundwater samples will be analyzed for Total Petroleum Hydrocarbons (TPH) using the TDEC Gasoline Range Organics (GRO) Method. Total Benzene, Toluene, and Xylene (BTX) will be analyzed using EPA Method 5030/8020.

Soil and groundwater samples collected for RFI use will be analyzed for volatile organic compounds (CLP), PCB/pesticides (8080), RCRA Appendix IX total metals (6010/7000 series), and TPH (GRO).

1.10 Material Disposal

All borehole cuttings will be contained in DOT 17-C, open-top, 55-gallon drums, permanently labeled by boring number and stored in a location designated by the Activity. Development water will be contained in separate DOT 17-C, open-top, 55 gallon drums, permanently labeled by well number and stored in a location designated by the Activity. A representative sample of containerized soil and water will be collected for each tank area. The samples will be characterized through laboratory analysis to determine if the material must be disposed of as a hazardous waste or a solid waste. The samples will be analyzed for TCLP metals and organics (except PCB/pesticides) and will have a GC/MS library search conducted on them for F001 - F005 solvents. The analyses will be paid for with DERA funds and will serve as the disposal analyses for the entire UST investigation. Once characterized and properly labelled by E/A&H, it will be the responsibility of the Activity to select a transporter and a disposal facility. E/A&H can assist the Activity by providing a list of potential transportation vendors and disposal facilities to choose from. E/A&H can also make disposal arrangements after the Activity selects the transporter and disposal facility.

1.11 Environmental Assessment Report

A draft and final Environmental Assessment Report (EAR) will be completed according to the guidance provided by the TDEC Division of Underground Storage Tanks. Following SOUTHDIV review and comment on the draft EAR, the final EAR will be prepared for submittal to SOUTHDIV and the TDEC.

The principal format for the EAR will be as follows:

Executive Summary

The executive summary will describe the overall findings of the project including conclusions and interpretation of data generated during the assessment.

Introduction

The introduction will summarize and delineate the objectives of the POA, give a brief site history and provide any new or revised information not previously stated in earlier reports.

Site Location

Will include vicinity, site and topographic maps, as well as a description of the local topography and any effects it may have on contaminant migration.

Groundwater Investigation

A discussion of the groundwater investigation, will include:

1) Rationale for the number and placement of wells
2) Hydrogeology
3) Monitoring Wells
    a) Construction
    b) Identification
    c) Surveying
    d) Development
4) Analytical Results
5) Water Level Data
6) Groundwater Classification Procedures

a) Water Use Survey Data
b) Analytical Sampling Data (if applicable)
c) Slug Test Data
d) Applicable Cleanup Levels

7) Groundwater Contaminant Plume Maps

Soil Investigation

A description of the soil investigation includes:

1) Rationale for number and placement of soil borings
2) Regional and Site Geology
3) Soil/Bedrock Boring Results
   a) Drilling and sampling methods
   b) Boring logs
4) Analytical Results
5) Soil Cleanup Levels
   a) Permeability sampling and testing
   b) Cleanup level determination
6) Soil Contaminant Plume Maps

Signature Page

This page will be signed by a Professional Geologist registered in the State of Tennessee.

1.12 Corrective Action Plan

In accordance with TDEC requirements, a Corrective Action Plan (CAP) will be prepared and submitted in final form upon completion of the EAR. Before the final CAP is prepared for submittal to the TDEC, a draft CAP will be prepared according to TDEC guidance and

submitted to SOUTHDIV for review and comment. The CAP will discuss the top three technologically feasible and reliable corrective action options which were considered and will describe in detail the specifications and estimated itemized costs of the corrective action chosen. If no soil or groundwater contamination above the applicable cleanup levels was found during the environmental assessment, no further action will be necessary and a CAP will not need to be submitted to the TDEC.

1.13 Project Schedule

The schedule below has been prepared to show the order of investigative tasks and the relative elapsed time for each major task. The schedule assumes that TDEC reviews will require four weeks and that laboratory turnaround times will not exceed three weeks. The schedule begins on Day 0, defined as the date written approval of the final EAP is received from SOUTHDIV.

To remain cost effective while maintaining a high degree of confidence in the data generated by the study, schedule changes may be necessary. The sequence and schedule of field activities presented in this document will be maintained unless the Task Order Manager determines that schedule alterations are required due to changes in the scope of work, uncontrollable factors such as weather or site access, or similar problems. Schedule changes will be closely coordinated with the EIC and Activity personnel.

A draft EAR will be submitted to the SOUTHDIV EIC within 20 working days after receipt of analytical results from the laboratory. Assuming there are no unexpected delays, submittal will be approximately 60 days from the startup of field work. A final EAR and draft Corrective Action Plan (CAP) will be prepared for submittal to SOUTHDIV and the TDEC within 10 working days following comments from SOUTHDIV on the draft EAR. A final CAP will be submitted to SOUTHDIV within 10 working days of receipt of comments from the TDEC.

ESTIMATED PROJECT SCHEDULE

WEEK 0	Written approval of final EAP
WEEK 2	Field startup
WEEK 4	Field work completed and samples shipped to laboratory for analysis
WEEK 7	Analytical results received from laboratory
WEEK 11	Submit draft EAR to SOUTHDIV/Begin work on draft CAP
WEEK 13	Receive comments on draft EAR from SOUTHDIV
WEEK 15	Submit final EAR/draft CAP to SOUTHDIV for subsequent submittal to TDEC
WEEK 19	Receive TDEC comments on final EAR/draft CAP
WEEK 21	Submit final CAP to SOUTHDIV

2.0 QUALITY ASSURANCE PLAN

2.1 Introduction

This document presents policies, project organization and objectives, functional activities, and quality assurance/quality control measures intended to achieve data quality goals of an environmental assessment to be performed by EnSafe/Allen & Hoshall. The assessment will be performed at the Aircraft Firefighting Training Facility (AFFTF) UST site at NAS Memphis, Millington, Tennessee (MATs 392 and 305; Tank Numbers 1489 and 1508). The project contract number is N62467-89-D-0318.

This document is intended to fulfill requirements for ensuring that all work will be conducted in accordance with quality assurance/quality control protocols and field procedural protocols for environmental monitoring and measurement data as established in:

- Naval Energy and Environmental Support Activity. (June 1988). (NEESA 20.2-047B) *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*, Port Hueneme, California
- Naval Energy and Environmental Support Activity. (February 1985). (NEESA 20.2-031A) *Ground-Water Monitoring Guide*, Port Hueneme, California
- Southern Division Engineering Command. (Revision 4, March 1989). *SOUTHDIV Guidelines for Groundwater Monitoring Well Installation*, Charleston, South Carolina

Where specific NEESA guidelines do not exist, applicable EPA and/or Tennessee Department of Environment and Conservation (TDEC) petroleum storage tank guidelines and methods will be applied. These regulations are referenced in specific sections of this document (where applicable).

2.2 Project Description Objective

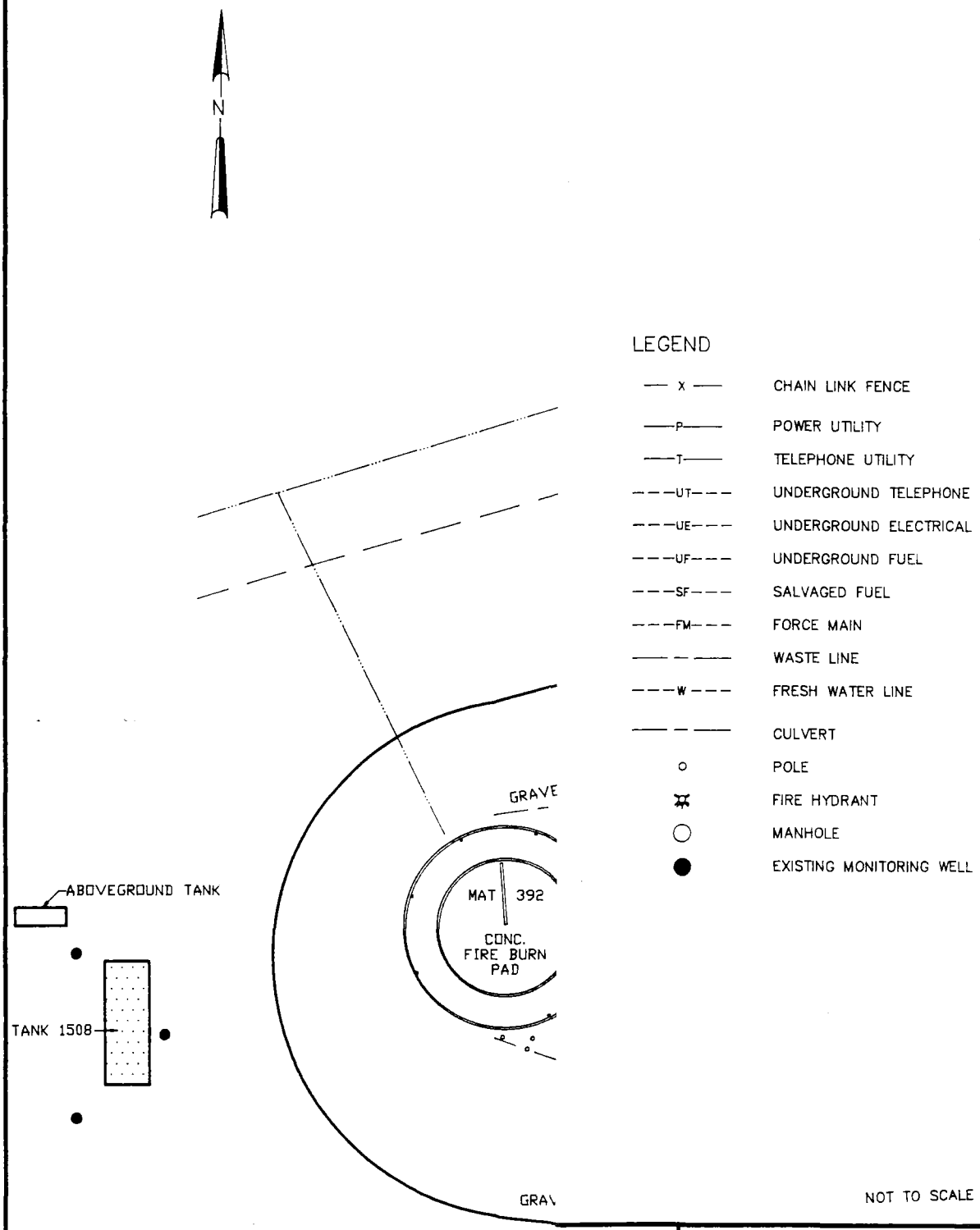
The objective of the environmental assessment is to assess the vertical and lateral extent of contamination, if any, to the shallow soil zone and water table aquifer resulting from leaks reported in Tank Systems 1489 and 1508. The Environmental Assessment Plan (EAP) is designed to produce data of sufficient technical quality to assess the current site conditions and determine if contamination is present and corrective action needed.

The objective will be accomplished by completing a series of shallow soil borings and converting up to 11 borings to shallow monitoring wells. Soil samples will be collected during the completion of all soil borings. Groundwater samples will be collected from all completed monitoring wells and at least two existing release detection wells. In addition, soil and groundwater samples will be collected to obtain information useful for an RFI investigation at NAS Memphis.

Site Background

The AFFTF has been an active facility since 1949 and has been designated as SWMU No. 5 for an upcoming RCRA Facility Investigation. The AFFTF (Figure 2-1) consists of east (MAT 305) and west (MAT 392) fire mats on several acres of land. The east mat has three 1,800-gallon USTs (1489,1490,1491) and the west has one 5,000-gallon UST (1508). The tanks store JP-4 fuel used in aircraft firefighting exercises conducted on MATs 305 and 392. A tank tightness test conducted on July 2, 1991 indicated that the west tank and one of the east tanks (1489) were leaking. The two tanks have been taken out of service. The amount of fuel released is not known.

Waste fuel and water drains from the fire mats to an oil/water separator where the separated JP-4 fuel is pumped back to fire MAT 305 and burned during training exercises. Prior to 1977,



ATION

ENNESSEE

FIGURE 2-1
SITE MAP

DATE: 06/03/92 | DWG NAME: C1

the water-fuel-foam mixture from training activities routinely overflowed onsite. The oil/water separator was installed in 1977 and since then there have been several documented releases, including overflows of the separator. It is believed that waste oils and solvents were burned with the fuel in the past, therefore it is possible that contaminants other than petroleum may be present (solvents, metals, etc.).

Seven release detection wells were installed adjacent to the tanks in December 1989. Three of these wells are located around the west tank. The other four wells are located at each corner of the tank pit for the three east tanks. According to the logs for these wells (Appendix A), the water table was at approximately 13 feet at the time of their installation. Groundwater flow is believed to be to the southwest.

2.3 Project Quality Assurance Objectives

In general, quality assurance (QA) objectives of EnSafe/Allen & Hoshall projects conducted as part of the Navy technical services contract are to assess and document the precision, accuracy, representativeness, completeness, and comparability of all sampling and analysis performed. Quality criteria are outlined here to assure suitability of data obtained during projects for its intended use, and to meet goals established by NEESA. The Navy has stipulated that Level C quality control (QC) criteria are to be applied to all laboratory analyses required for this investigation as outlined in NEESA 20.2-047B. The following is a discussion of project-specific level of effort for QA and data quality criteria.

2.3.1 Field Measurements

QA objectives for parameters to be measured in the field by EnSafe/Allen & Hoshall personnel are presented in Table 2-1. Field measurements will include pH, temperature, specific conductance, and static groundwater level.

TABLE 2-1
FIELD MEASUREMENTS

Measurements Parameter	Reference	Matrix	Precision (%)	Accuracy % Recovery	Completeness %
pH	EPA 150.1[a]	Water	± 0.05 pH	± 0.2 pH	100
Temperature	EPA 170.1[a]	Water	± 0.1° C	± 0.2° C	100
Static Water Level	SOP[b]	Water	± 0.01 ft.	± 0.005 ft.	100
Specific Conductance	EPA 120.1[a]	Water	± 10%	± 10 umhos/cm (<1000 umhos/cm) ± 100 umhos/cm (>1000 umhos/cm)	100
Photoionization Detector	SOP[c]	Air	± 10 ppm	± 20 ppm	100
Well Survey Points	SOP[d]	Spatial	± 5%	± 0.1 feet	100
	SOP[d]	Vertical	± 0.05 feet	± 0.01 feet	100

Notes:

[a] - Methods for Chemical Analysis of Water and Wastes, EPA-600/4/79-020, Revised March 1983.
[b] - Manufacturer's SOP for static water level measurement.
[c] - Manufacturer's SOP for operation of Photovac TIP II or HNu.
[d] - Standard land surveying methods as employed by Registered Land Surveyors.

2.3.2 Sampling and Analysis for Contamination Level

Project QA objectives of analytical parameters for soil and groundwater will be as stipulated in their respective analytical methods, and as determined by the analytical laboratory's historical data quality evaluation for the methods. The NEESA laboratory approval process will ensure that laboratory method QA/QC standards are appropriate to meet goals for intended data uses. Anticipated general QA goals for these methods are presented in Table 2-2. The practical quantitation limit for the TDEC Gasoline Range Organics TPH method is 5 ppm for soil samples and 0.1 ppm for water samples. Analytical method detection limits for other parameters are included as Appendix B.

2.3.3 Precision and Accuracy

Methods of assessing precision and accuracy measurements are discussed in Section 2.16 of this document. General precision and accuracy goals for laboratory analytical procedures (NEESA Level C) are provided in Table 2-2.

TABLE 2-2 LABORATORY MEASUREMENTS

Measurement Parameter	References	Matrix	Precision[1] (%)	Accuracy[1] % Recovery	Completeness (%)
Volatile Organic Compounds	CLP	Soil	±35	±40	90
		Water	±25	±40	90
Semivolatile Organic Compounds	CLP	Soil	±35	±45	90
		Water	±35	±55	90
BTX	EPA Method 5030/8020	Soil	±35	±40	90
		Water	±25	±40	90
Total Petroleum Hydrocarbons	TDEC Gasoline Range Organics Method	Soil	±30	±50	90
		Water	±30	±50	90
Cyanide, Total	EPA Method 9010	Soil	±20	±25	90
		Water	±20	±25	90
Organochlorine Pesticides/PCBs	EPA Method 8080	Soil	±25	±25	90
		Water	±25	±40	90
Appendix IX (RCRA) Total Metals (Pb, Cd, As, Se, Hg)	EPA Method 7000 Series	Soil	±25	±25	90
		Water	±25	±25	90
Appendix IX (RCRA) Total Metals (Others)	EPA Method 6010	Soil	±25	±25	90
		Water	±25	±25	90

Note:

[1] - Precision and accuracy goals are subject to change based upon specific method data quality history for the analytical laboratory chosen.

2.3.4 Representativeness

By properly collecting soil and groundwater monitoring well samples and measuring well parameters in accordance with NEESA protocol (NEESA 20.2-031A, Sections 4.2.3.3 Split Spoon Samples, 7.1.1 Sample Withdrawal, and 7.2.1 Bailers) and the EPA Region IV Environmental Compliance Branch *Standard Operating Procedures and Quality Assurance Manual (SOP/QAM)* (February 1991), samples collected during investigations will be representative of areas of concern.

2.3.5 Completeness

Completeness goals for field measurements reflect the ability to resample all existing and planned wells. The completeness goals for laboratory measurements take into consideration unavoidable non-attainment of QA goals which may occur over the course of the study. Efforts will be made to maintain soil and groundwater data completeness levels above the 90 percent level.

2.3.6 Comparability

Comparability is assured through the use of established methods of sampling and analysis as specified in NEESA 20.2-031A and NEESA 20.2-047B, as well as other accepted methods such as the EPA SOP/QAM. These methods were discussed in the project EAP (Section 1.0) and in subsequent sections of this QAP.

2.4 Project Organization and Responsibilities

Overall responsibility for projects conducted in accordance with NEESA guidance will be vested in NEESA (or its approved representative). Therefore, project coordination responsibilities lie with the SOUTHDIV Engineer In Charge (EIC). The following narrative describes the components of the project chain-of-command as established in NEESA 20.2-047B.

2.4.1 Oversight

Navy Energy and Environmental Support Activity

NEESA is responsible for ensuring that the quality of laboratory analyses performed during the various phases of CLEAN is acceptable. NEESA is also responsible for managing the NEESA Contract Representative (NCR).

Engineering Field Division

The EIC at the Engineering Field Division provides the site information and history, provides logistical assistance, specifies the sites requiring investigation and reviews results and recommendations. Mr. John Karlyk, SOUTHDIV, Naval Facilities Engineering Command, Charleston, South Carolina, serves as the EIC for this project.

Engineer-in-Charge

The EIC is responsible for coordinating procurement, finance, and reporting; for ensuring that all documents are reviewed by the NCR; for communicating comments from the NCR and other technical reviewers to the subcontractors; and for ensuring that the subcontractors address all the comments submitted and take appropriate corrective actions.

NEESA Contract Representative

The NCR is responsible for ensuring that each project has appropriate overall QA. The NCR reviews laboratory QA plans, work plans, submits performance sample data, provides field and laboratory audits, and reviews data from the site. Questions from subcontractors and the EIC regarding specific field and laboratory QC practices are directed to the NCR. The NCR also evaluates referee samples.

State or Local Oversight

The Tennessee Department of Environment and Conservation (TDEC) will also serve in an oversight capacity for this investigation. The Environmental Assessment Plan (EAP) will be prepared in accordance with TDEC requirements and guidelines. The investigative results will be presented to the TDEC in the form of an Environmental Assessment Report (EAR). This field investigation has been requested in accordance with the requirements of the TDEC's *Division of Underground Storage Tanks Reference Handbook* (January 1992).

2.4.2 Investigation Performance

The following individuals or firms will be responsible for the implementation of all work plan activities.

Engineering Subcontractor

EnSafe/Allen & Hoshall will serve as the engineering subcontractor for this project. As such, EnSafe/Allen & Hoshall is responsible for designing and implementing the field investigation activities. The EnSafe/Allen & Hoshall Task Order Manager is Mr. Lawson Anderson. The EnSafe/Allen & Hoshall Quality Assurance Officer is Mr. Mark Bowers.

Analytical Laboratory

The analytical laboratory employed by EnSafe/Allen & Hoshall must be a State-approved laboratory and must also adhere to the laboratory requirements in NEESA 20.2-047B (or other QA and method requirements as specified). The laboratory is required to prepare and submit a laboratory QA plan, to analyze and submit the results of proficiency testing, to submit to an onsite inspection, and to correct any deficiencies cited during the inspection by the NCR. The laboratories are required to identify a Laboratory QA Coordinator (LQAC) responsible for overall QA. The LQAC must not be responsible for schedule, costs, or personnel other than

QA assistants. It is preferred that the LQAC report to the Laboratory Director. The LQAC must have the authority to stop work on projects if QC problems arise which affect the quality of the data produced.

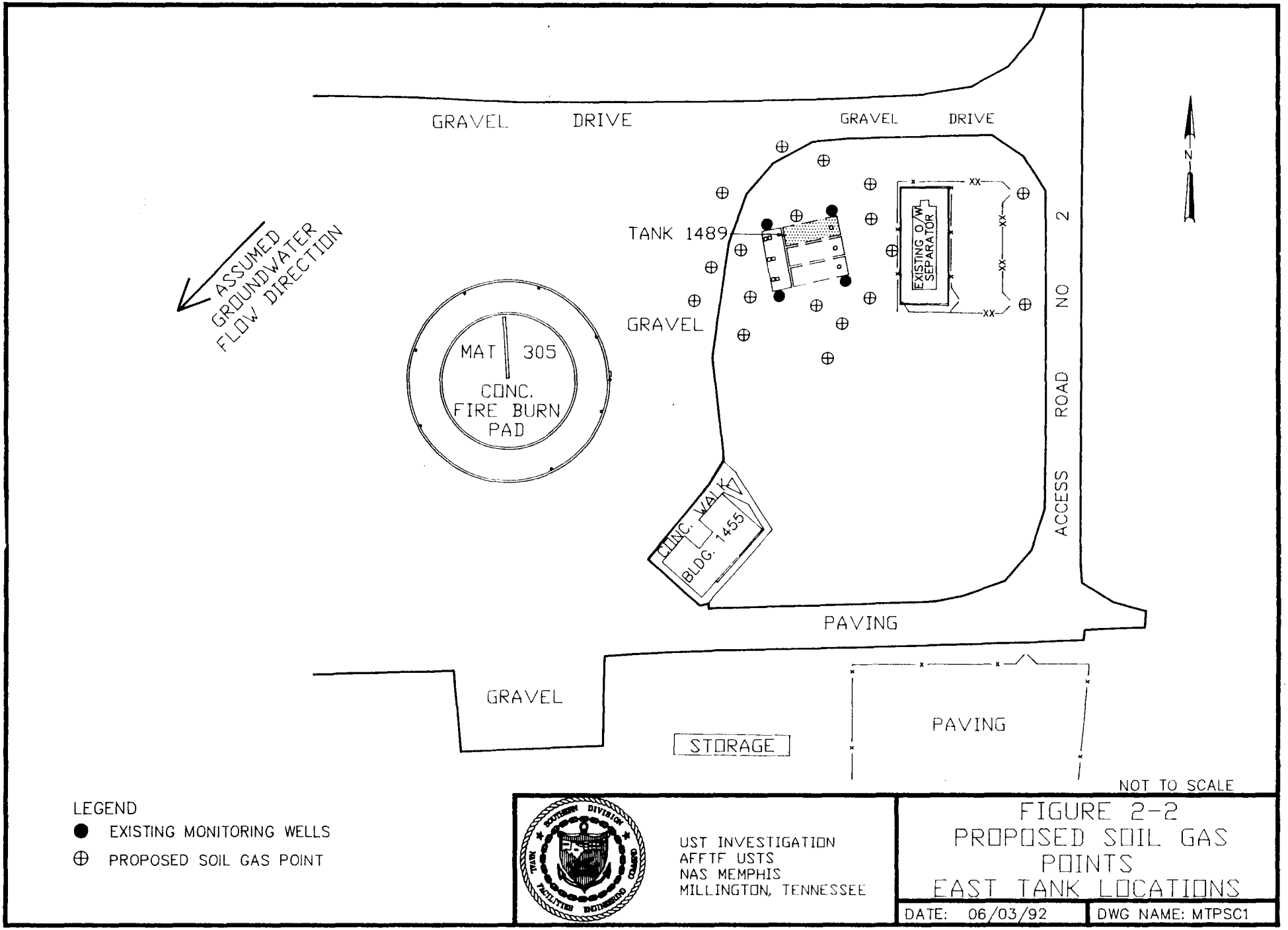
In addition to conforming to NEESA guidance, work shall be performed in a manner consistent with:

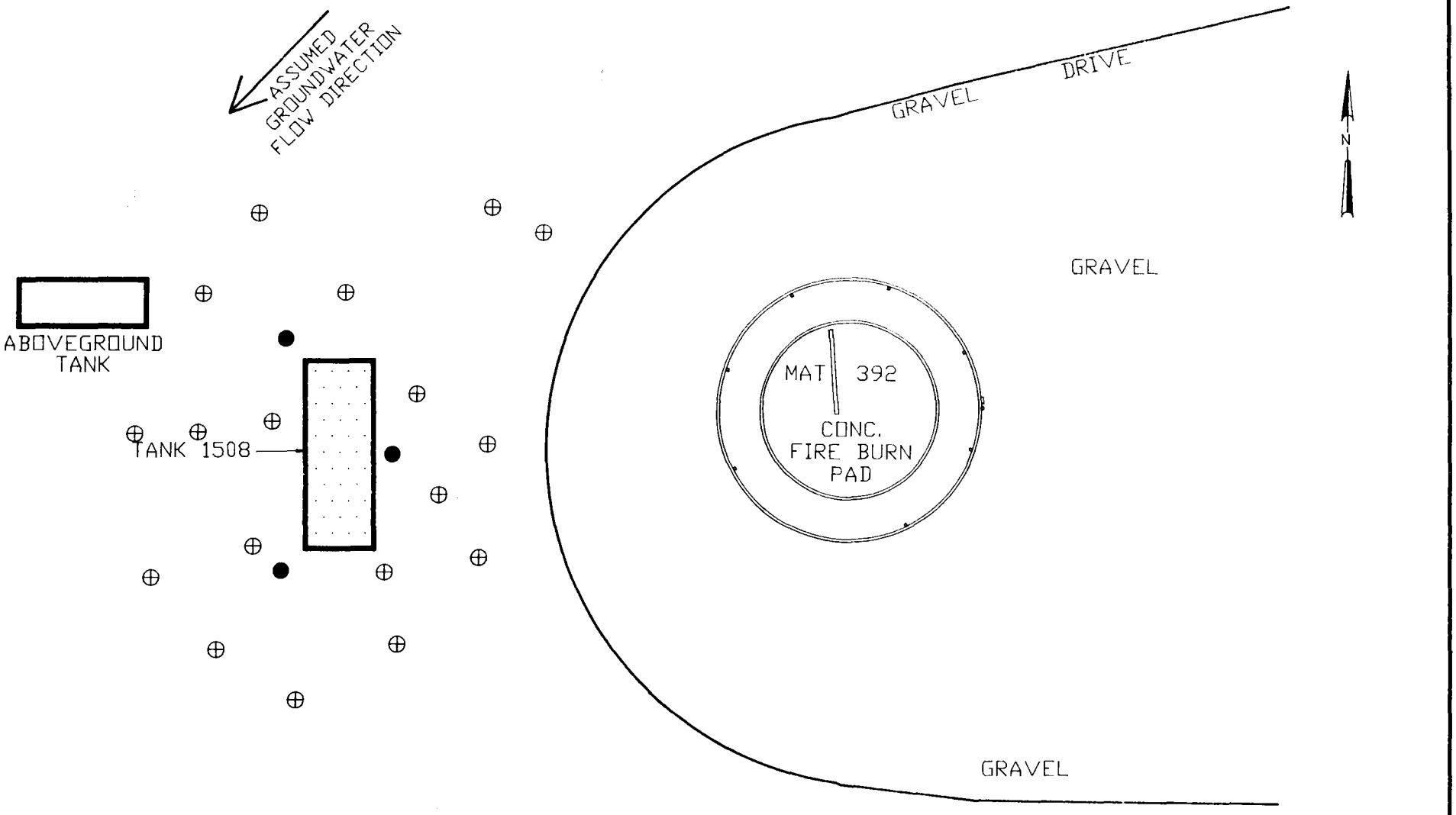
- The Resource Conservation and Recovery Act of 1976 (RCRA).
- The Hazardous and Solid Waste Amendments of 1984 (HSWA).
- The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended.
- The National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Title 40 Code of Federal Regulations (CFR), Part 300, as amended.
- Other appropriate federal, state, and local guidelines, rules, regulations, and criteria (where applicable).

2.5 Soil Gas Survey

The soil gas survey will aid in determining the nature and extent of possible contamination. Approximately 36 soil gas measurements will be completed, each at a maximum depth of 20 feet. Results of the soil gas survey will aid in the final placement of monitoring wells. Eighteen measurements will be completed in the vicinity of each tank to meet these objectives. Figures 2-2 and 2-3 show the proposed locations for the 36 soil gas points. These locations are subject to change depending upon field data and subsequent consultation with the SOUTHDIV EIC.

The preferred soil gas survey technique for this site will use a hydraulic probe to reach the sampling depth desired. The sampling probe will be pushed by a truck-mounted hydraulic press to the proper sampling depth (approximately 20 feet). Soil gas will be extracted by applying a


GRAVEL
DRIVE
GRAVEL
DRIVE
N
ASSUMED GROUNDWATER FLOW DIRECTION
TANK 1489
EXISTING O/W SEPARATOR
XX
XX
XX
XX
GRAVEL
MAT 305
CONC. FIRE BURN PAD
ACCESS ROAD NO 2
CONC. WALK
BLDG. 1455
PAVING
GRAVEL
STORAGE
PAVING
NOT TO SCALE
LEGEND
EXISTING MONITORING WELLS
PROPOSED SOIL GAS POINT
UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 2-2
PROPOSED SOIL GAS POINTS
EAST TANK LOCATIONS
DATE: 06/03/92
DWG NAME: MTPSC1



NOT TO SCALE

UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 2-3
PROPOSED SOIL GAS POINTS
WEST TANK LOCATIONS

DATE: 06/03/92 | DWG NAME: MTNPC1

vacuum through the probe and collecting the gases in a sample collection container. The sample will be analyzed onsite for volatile organic compounds using a portable gas chromatograph.

2.6 Soil Borings and Sampling

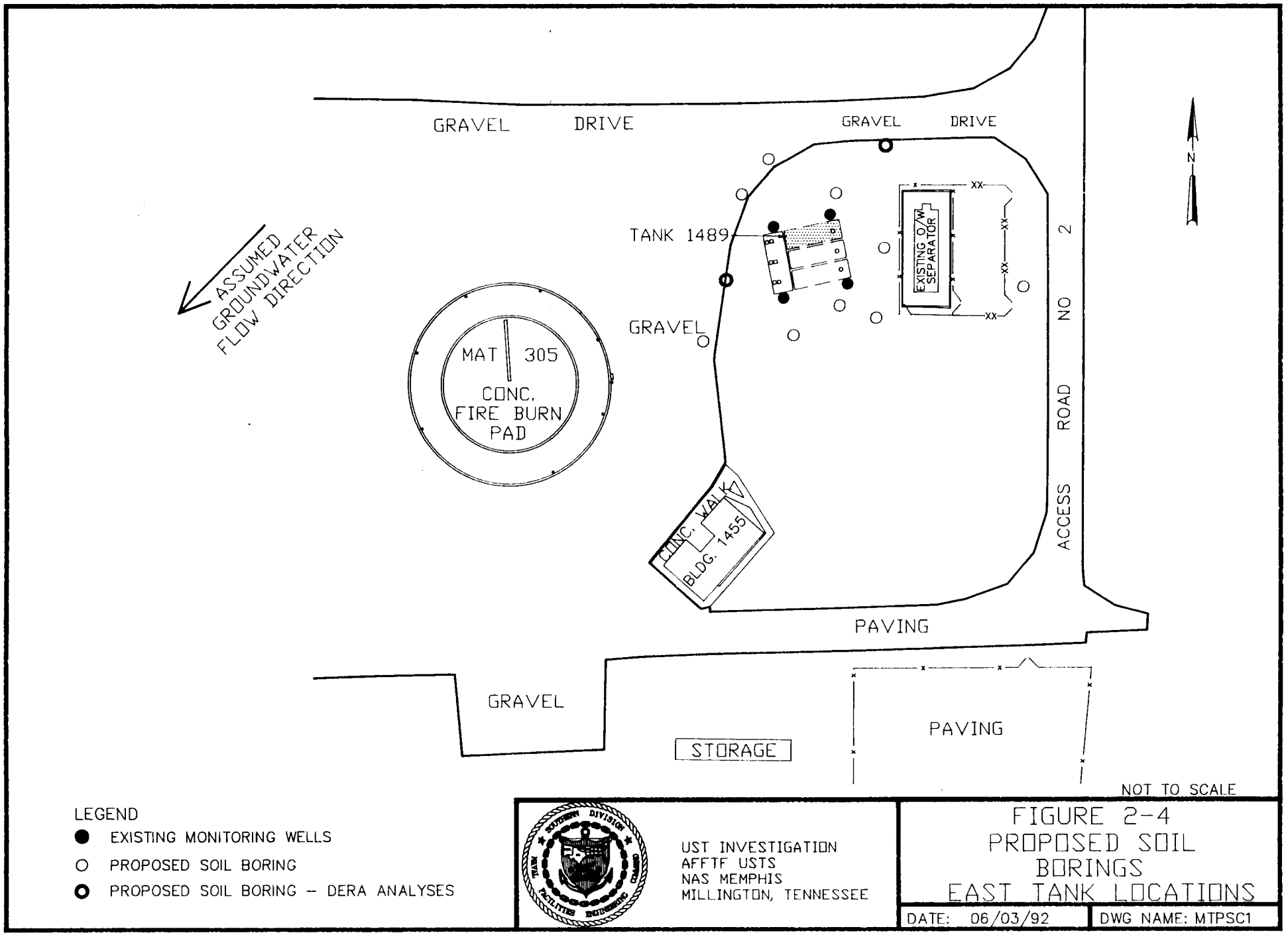
2.6.1 Soil Sampling Procedures

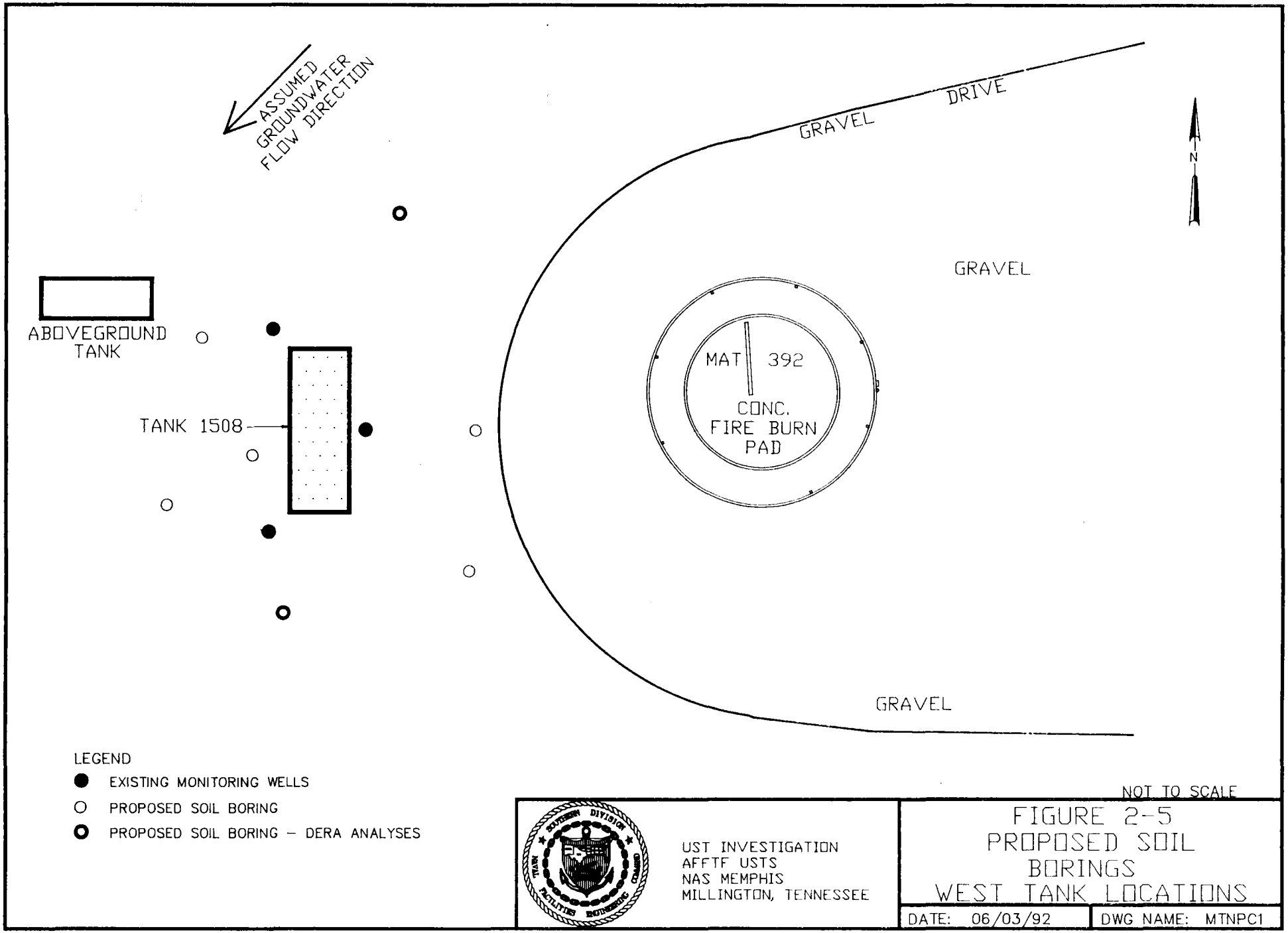
Soil samples will be collected in accordance with *SOUTHDIV Guidelines for Groundwater Monitoring Well Installation* and NEESA 20.2-031A, Chapter 4 — Monitor Well Drilling. The specific sampling method is discussed in Section 4.2.3.3 — Split Spoon Samples.

Proposed soil boring locations are shown in Figures 2-4 and 2-5. Up to 20 soil borings are currently proposed for the investigation of the AFFTF site. Four borings/wells are the minimum required by the TDEC for an environmental assessment. Up to 11 of the borings are proposed to be completed as monitoring wells. Continuous soil samples will be collected through the center of hollow-stem augers using a 5-foot CME continuous sampler.

One to three soil samples will be collected from each boring for laboratory analysis. A soil boring log (Figure 2-6) will be prepared for each boring advanced onsite.

The TDEC requires that one of the samples to be analyzed be collected at the point of highest contamination as determined by field screening. Screening will be accomplished by splitting each soil sample (from each interval) into two samples. The first subsample will be placed in the appropriate containers for possible laboratory analysis. The second subsample will be placed in an air-tight container (sealable plastic bag or clean glass jar) leaving some airspace. Each sample will be allowed a minimum volatilization time of 15 minutes at a temperature no cooler than 68°F. All samples should be allowed to volatilize for an equal period of time prior to


GRAVEL
DRIVE
GRAVEL
DRIVE
N
ASSUMED GROUNDWATER FLOW DIRECTION
TANK 1489
EXISTING O/W SEPARATOR
XX
XX
XX
XX
GRAVEL
MAT 305
CONC. FIRE BURN PAD
ACCESS ROAD NO 2
CONC. WALK
BLDG. 1455
PAVING
GRAVEL
STORAGE
PAVING
NOT TO SCALE
LEGEND
EXISTING MONITORING WELLS
PROPOSED SOIL BORING
PROPOSED SOIL BORING – DERA ANALYSES
UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 2-4
PROPOSED SOIL BORINGS
EAST TANK LOCATIONS
DATE: 06/03/92
DWG NAME: MTPSC1



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MILLINGTON, TENNESSEE

FIGURE 2-5
PROPOSED SOIL BORINGS
WEST TANK LOCATIONS

DATE: 06/03/92

DWG NAME: MTNPC1

LOCATION OF BORING	JOB NO.	CLIENT	LOCATION

DRILLING METHOD:	BORING NO.
	SHEET
SAMPLING METHOD:	OF
	DRILLING
	START / FINISH
WATER LEVEL	TIME / TIME
TIME	
DATE	DATE / DATE
CASING DEPTH	

DRILLING CONTR _____

DATUM _____ ELEVATION _____

BY _____ CHK BY _____

DATE _____

SAMPLER TYPE	INCHES DRIVEN / INCHES RECOVERED	DEPTH OF CASING	SAMPLE NO. / SAMPLE DEPTH	BLOWS/FT SAMPLER	VAPOR CONCENTRATIONS PPMO	DEPTH IN FEET	SOIL GRAPH	SURFACE CONDITIONS:
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		
						1		
						2		
						3		
						4		
						5		
						6		
						7		
						8		
						9		
						0		

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MILLINGTON, TENNESSEE

FIGURE 2-6
SOIL BORING LOG

DATE: 04/17/92 | DWG NAME: CLENBORL

screening. Afterwards, headspace will be sampled with an Organic Vapor Detector (OVD). The OVD shall either be a photoionization detector or a flame ionization detector.

If the OVD reading and other field screening (e.g., visual observation) indicate that contamination does not exist in the soil at the boring location, then the deepest sample collected will be analyzed by the laboratory. The deepest sample is defined as that sample collected immediately above the soil/bedrock interface, the water table, or the bottom of the boring,whichever occurs first. If the OVD reading indicates that contamination does not exist but visual the soil/bedrock interface, the water table, or the bottom of the boring, whichever occurs first. If one sample meets both of these criteria, then only that sample is required for laboratory analysis.

If the OVD reading indicates that contamination is present in the soil at a boring location, three soil samples from that boring must be submitted for laboratory analysis. In accordance with TDEC guidance, the samples selected for analysis will be: (1) from where the OVD screening indicated the highest level of contamination, (2) the deepest sample in which the OVD screening indicated contamination, and, (3) the sample collected from either immediately above the soil/bedrock interface, the water table, or the bottom of the boring, whichever came first. If one soil sample meets more than one of the criteria listed above, the sample with the second highest OVD reading shall also be submitted for laboratory analysis.

The sampling process is discussed in more detail in Section 1.6 (EAP) and also in the EPA SOP/QAM. The selected samples will be cooled in an ice chest to 4°C ($\pm$ 2° C) and shipped under chain-of-custody via overnight courier to the selected laboratory for analysis.

2.6.2 Soil Sample Analyses

Soil samples will be analyzed for Total Petroleum Hydrocarbons (TPH) using the Gasoline Range Organics (GRO) Method specified by the TDEC for hydrocarbon mixtures such as gasoline or other low boiling hydrocarbons (70° - 180°F). The soil samples will also be analyzed for Total BTX (EPA Method 5030/8020).

Soil samples for the RFI investigation will be analyzed for volatile organic compounds (CLP), semivolatile organic compounds (CLP), PCB/pesticides (8080), RCRA Appendix IX total metals (6010/7000 series), and TPH (GRO).

2.6.3 Determining Soil Permeability

Two undisturbed soil samples (Shelby tubes) will be collected in the unsaturated zone and within or below the zone of suspected soil contamination. These samples will be collected adjacent to the fourth boring. The first Shelby tube shall be collected at the depth that is believed to represent the zone of highest permeability based on the samples obtained from the fourth boring. The second Shelby tube will be collected immediately above the soil/bedrock interface or water table, whichever comes first. If one soil sample meets both of these criteria, the second Shelby tube shall be taken at the depth where the second highest permeability would be expected. If there is no evidence of contamination in the fourth boring, the samples should be collected where the highest permeability would be expected. The sample with the highest permeability will govern the stringency of cleanup levels.

The thin-walled tube sampling method (ASTM Method D1587) shall be used to collect the samples. The permeabilities shall be determined using the Triaxial Cell or Pressure Chamber Permeameter Methods, as described in Method 9100 of *Test Methods for Evaluating Solid Wastes, Third Edition (SW-846).*

2.6.4 Soil Sample Documentation

Soil samples will be documented in accordance with *SOUTHDIV Guidelines for Groundwater Monitoring Well Installation*, Parts 3 and 4 and NEESA 20.2-031A, Chapter 6 — Monitoring Well Data Record Requirements, and as discussed in Section 2.7 of this QAP. EnSafe/Allen & Hoshall personnel will use site-specific, bound logbooks for the maintenance of field records pertaining to the investigation. These records will document visual observations, calculations, and equipment calibrations. Every entry will be dated and the time for each entry noted. The logbooks are accountable documents that will be properly maintained and retained as part of the project files. In addition, soil boring logs will be produced for all soil borings advanced onsite beyond a depth of 5 feet. Information to be included on boring logs includes total depth of boring, lithologic descriptions of each geologic formation encountered, blow counts for continuous sampler penetration, sampling intervals, OVD readings, field observations (e.g., staining or odor), soil moisture/initial water, and any subsurface obstructions encountered during boring advancement (with explanations, if available). Field logs will be retained in their original condition in the EnSafe/Allen & Hoshall project file.

2.6.5 Soil Sampling Equipment Decontamination

Prior to drilling, the drill rigs and other equipment will be inspected for any lubricant or fuel leaks which might contaminate soil or groundwater. All down-hole equipment (e.g., continuous samplers, sampling rods, hollow-stem auger flights, etc.) will be high pressure, steam cleaned before onsite activities begin. Sampling equipment which is not pre-cleaned and disposable (stainless steel scoops, continuous samplers, etc,) will be properly decontaminated before each use by steam cleaning with a laboratory-grade detergent wash, followed by a potable water rinse and a final deionized or distilled water rinse. Disposable latex gloves will be worn during all sampling phases which require handling of samples. A new pair of gloves will be donned before handling each sample. These procedures are in accordance with *SOUTHDIV Guidelines for*

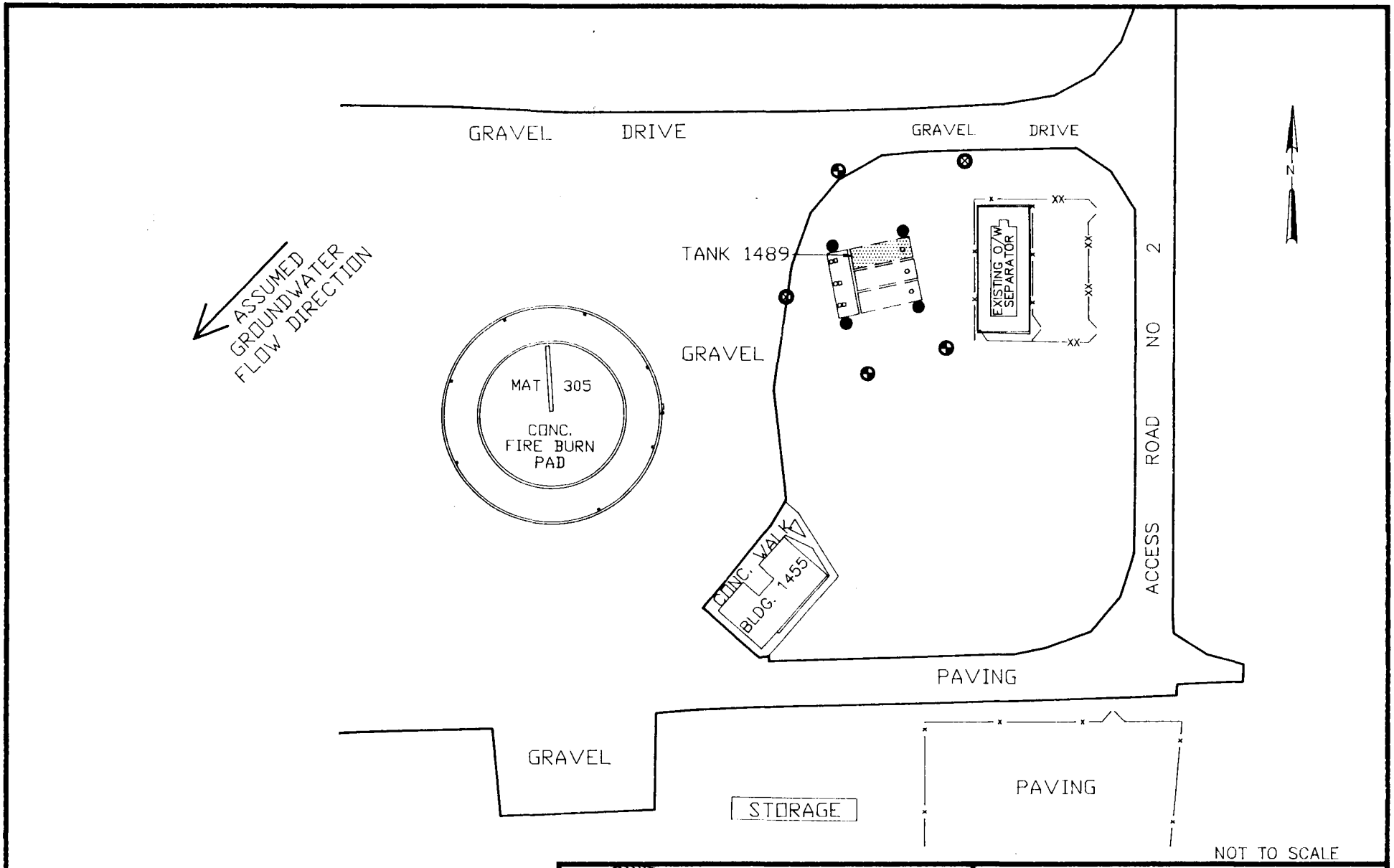
Groundwater Monitoring Well Installation, Part 3.5 and NEESA 20.2-031A Chapter 3.3.2.1. Equipment used to sample for RFI parameters will have an isopropanol rinse and a deionized/organic-free water rinse following the potable water rinse.

2.7 Monitoring Well Installation

Figures 2-7 and 2-8 show the proposed locations for the initial monitoring wells. Each of the wells will be logged by a qualified field geologist during installation. Each well will be constructed using a 10-foot section of 2-inch diameter, 0.01-inch slot size, Schedule 40 PVC screen attached to 2-inch diameter, Schedule 40 PVC riser. The screen length and placement will be such that 7 feet of the screen is in the water table with 3 feet of the screen above the water table to allow the screen to intersect the water table at all times.

The borehole diameter will be at least 4 inches larger than the outside diameter of the well casing. At least 6 inches of filter pack material will be placed under the bottom of the well screen. It shall extend 2 feet above the screened section. The filter pack will consist of clean, washed, 20/40 silica sand. The sand is intended to prevent clogging of the screen slots. It will be tremied through the annulus of the hollow-stem augers.

A bentonite seal (bentonite pellets hydrated with distilled water) at least 2 feet thick, will be tremied on top of the sand pack to prevent infiltration of surface water down the outside of the well casing. During introduction of the sand pack and the bentonite seal, accurate measurements ($\pm$ 0.2 feet) will be made to the top of the pack and the seal with a weighted steel measuring tape or the tremie pipe itself.



LEGEND

- EXISTING MONITORING WELLS
- PROPOSED MONITORING WELL
- PROPOSED MONITORING WELL – DERA ANALYSES

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AFFTF USTS
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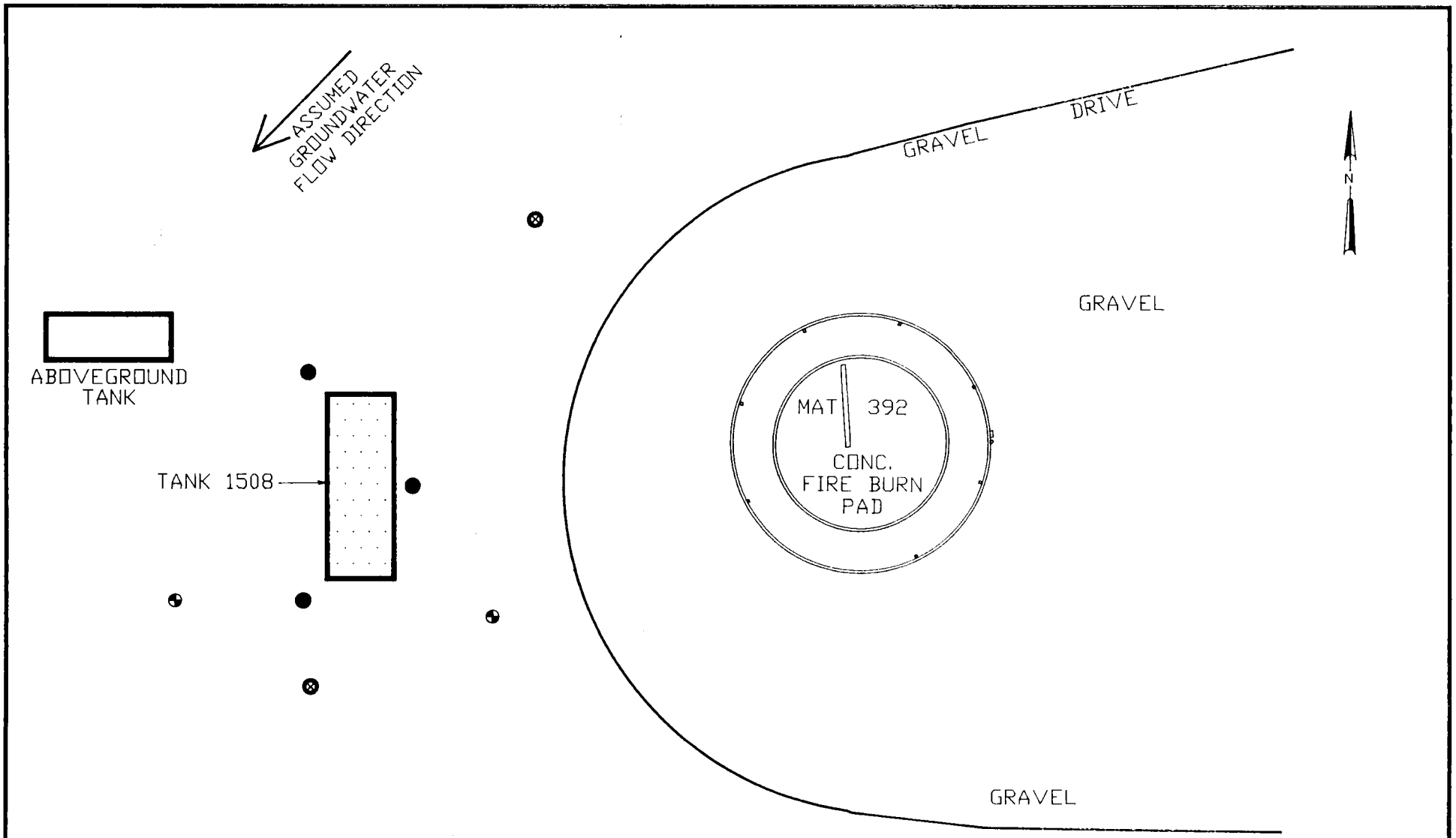
MILLINGTON, TENNESSEE

FIGURE 2-7
PROPOSED MONITORING WELLS
EAST TANK LOCATIONS

DATE: 06/03/92

DWG NAME: MTPSC1



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MILLINGTON, TENNESSEE

FIGURE 2-8
PROPOSED MONITORING WELLS
WEST TANK LOCATIONS

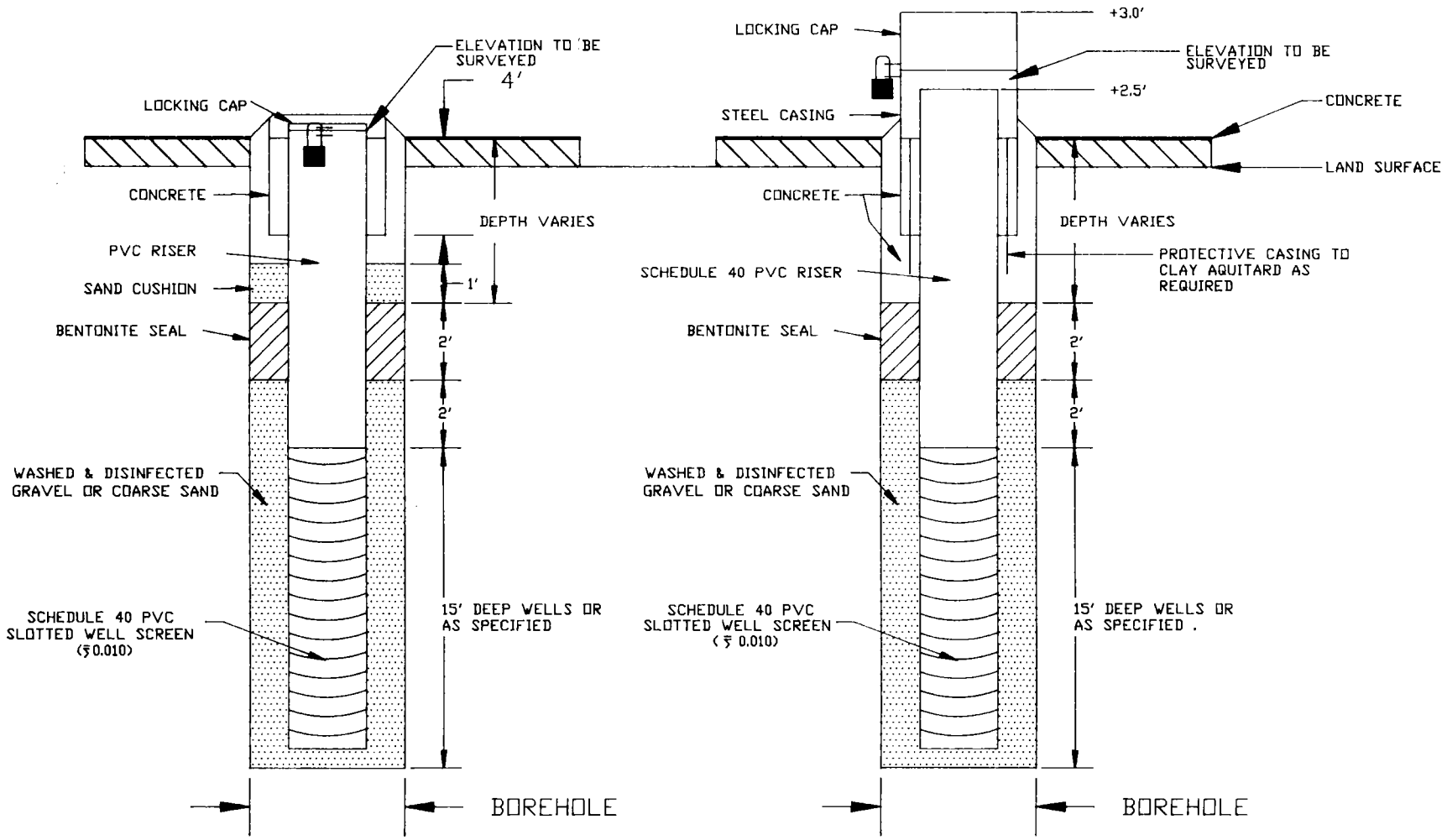
DATE: 06/03/92 | DWG NAME: MTNPC1

After allowing the bentonite seal to cure at least 12 hours, the remaining annulus of the borehole will be grouted with a Portland cement/bentonite mixture. The annular grout will consist of a mixture of Portland cement and 4 to 6 percent powdered bentonite.

To facilitate groundwater monitoring procedures and protect the integrity of the wells in unpaved areas, approximately 2.5 feet of stickup will be left above the ground surface at each monitoring well site. A 4'x4'x6" outwardly sloping concrete pad will surround the ground surface of each well casing. A 4-inch diameter steel post will be placed at each corner of the pad to protect the well. Wells in paved or high traffic areas will be finished at ground level, capped with a locking cap, and secured by a flush-mount (manhole style) protective covering. Figure 2-9 is a suggested schematic for the monitoring wells to be installed.

All monitoring wells will be surveyed by a State of Tennessee Registered Land Surveyor to the nearest 0.01 foot (vertically), incorporating USGS NAD '27 (horizontally). A permanent mark will be located at the top of each well casing to aid in generating accurate and consistent groundwater elevation data. After the wells are properly developed and surveyed, water level measurements will be recorded to determine groundwater flow direction, groundwater elevation in relation to mean sea level (msl), and to construct an accurate potentiometric surface diagram for the area of investigation. Static water levels will be measured using a water level indicator. Measurements will be at least 24 hours after completion of well development, but prior to purging.

Monitoring well development shall not begin until at least 24 hours following completion of the well and will continue until the water column is free of visible sediment. If the column does not produce water that is sediment-free, development shall continue until pH, specific



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MILLINGTON, TENNESSEE

FIGURE 2-9
MONITORING WELL SCHEMATIC

DATE: 04/17/92 | DWG NAME: KTWELL

conductance, and temperature have stabilized. Development may proceed by bailing, pumping, surging or other NEESA-approved methods.

Monitoring well installation notes, calculations, descriptions, and observations will be recorded in the project field logbook. In addition, well construction logs will be produced depicting components of the finished monitoring wells (e.g., total depth, depth to water, depth of filter pack, thickness of bentonite seal).

2.8 Groundwater Sampling

2.8.1 Static Water Level Measurement

Static water level measurements will be used to determine groundwater flow direction and to construct a potentiometric surface diagram of the area of investigation for inclusion in the Environmental Assessment Report.

2.8.2 Monitoring Well Purging

Before samples are collected, each well will be purged of standing water. At least three casing volumes (as calculated from static water level) will be purged from each well. If a well bails to dryness before three casing volumes are removed, the purged volume will be noted and an explanation will be given. Well purging will be performed using a PVC or Teflon bailer which is manually lowered and removed from the well. If the well is bailed dry, at least 24 hours will be allowed to pass between well purging and well sampling. The well purging process will be used to ensure that groundwater samples representative of the aquifer under investigation are obtained.

2.8.3 Groundwater Sampling Procedures

Groundwater monitoring wells will not be sampled if 0.01 foot or more of free product is encountered. A groundwater sample will be collected from each of the proposed wells and one existing release detection well at each site (east and west), in accordance with NEESA 20.2-031A, Chapter 7 — Ground-Water Sampling. Groundwater samples will be collected using a dedicated or disposable PVC bailer and nylon bailing rope. The bailer will be slowly lowered into the water column to minimize water column disturbance and possible loss of volatile parameters. The bailer will be manually retrieved and the samples will be immediately transferred to appropriate sample containers. The sampling process is discussed in further detail in the project EAP (Section 1.7) and outlined in the EPA SOP/QAM.

Monitoring wells which are to be sampled for RFI parameters will have dedicated or disposable Teflon bailers with teflon leaders.

2.8.4 Groundwater Sample Analyses

The TDEC has specified the use of the Gasoline Range Organics (GRO) Method for TPH analyses and EPA Method 5030/8020 for Total BTX. In addition, pH, temperature, and conductivity will be measured in the field for each sample collected. Oxidation-reduction potential and/or turbidity may also be measured in the field.

Water samples for the RFI investigation will be analyzed for volatile organic compounds (CLP), semivolatile organic compounds (CLP), PCB/pesticides (8080), RCRA Appendix IX total metals (6010/7000 series), and TPH (GRO).

2.8.5 Groundwater Sample Documentation

Groundwater samples will be documented in accordance with NEESA 20.2-047B, Chapter 3 — Site-Specific QC Requirements, and NEESA 20.2-031A, Chapter 6 — Monitoring Well Data Record Requirements, and as discussed in Section 2.6 of this QAP. EnSafe/Allen & Hoshall personnel will use site-specific, bound logbooks for the maintenance of field records pertaining to the investigation. These records will document visual observations, calculations, and equipment calibrations. Every entry will be dated and the time for each entry noted. The logbooks are accountable documents that will be properly maintained and retained as part of the project files. In addition, well installation logs will be produced for each well installed. The well installation logs will include total depth of boring, depth of well, screen interval, filter pack depth to top and construction materials depth to top of bentonite plug and type of bentonite, riser and screen materials and specifications, annular seal type and length of stickup.

2.8.6 Groundwater Sampling Equipment Decontamination

Equipment used in measuring and sampling groundwater monitoring wells will be decontaminated in accordance with *SOUTHDIV Guidelines for Groundwater Monitoring Well Installation*, Part 3.5 and NEESA 20.2-031A, Chapter 3.3 — Aquifer Protection requirements. Before site activities begin, it will be necessary for all bailers and the water level indicator to be decontaminated using a laboratory grade detergent wash, followed by a triple distilled water rinse, and allowed to air dry. Dedicated or disposable bailers will be used to prevent cross-contamination between wells. Disposable gloves will be worn during all measurement and sampling activities. A new pair of disposable gloves will be donned for each water sample and/or measurement. Equipment used to sample for RFI parameters will have an isopropanol rinse and a deionized/organic-free water rinse following the potable water rinse.

2.9 Sample Identification, Containers, Preservation, and Labeling

Pre-cleaned sample containers will be provided by the laboratory. EnSafe/Allen & Hoshall will receive the containers from a state-approved laboratory that has followed NEESA 20.2-047B, Chapter 3.5 — Sample Container Cleaning Procedures (and/or other applicable protocol), and the containers will remain in the custody of EnSafe/Allen & Hoshall personnel. Soil samples for Gasoline Range Organics TPH analyses will be collected in 250 ml. (or 8 oz.) glass jars with Teflon-lined septum lids. Soil samples collected for Total BTX analyses will be collected in 125 ml. (or 4 oz.) glass vials with Teflon-lined lids. Water samples for TPH and Total BTX will be collected in 40 ml. amber glass vials with Teflon-lined septa. While in the field and during transport to the laboratory, all samples will be retained in a field cooler with ice packs to maintain sample temperature at approximately 4° C (± 2° C). All BTX water samples will be preserved with 4 drops of 1:1 HCL to reduce pH levels below 2. All TPH water samples will be preserved with 200 ul of 50% HCL. Proper acidification will be verified using litmus paper or a portable pH meter. Holding times for TPH (soil and water) shall not exceed 28 days prior to analysis. Holding times for BTX (soil and water) shall not exceed 14 days prior to analyses. Sample containers, preservation and holding times are summarized in Table 2-3.

TABLE 2-3
SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

Analytical Method	Sample Matrix	Container Size/ Material	Sample Preservation	Holding Time
Total Petroleum Hydrocarbons Gasoline Range Organics Method (TDEC)	Soil	250 ml Glass Jar w/Teflon-lined lid	Chill, 4°C	Analyze within 28 days
	Water	(3) 40 ml amber glass vial w/Teflon-lined septa	Chill, 4°C pH<2, 50% HCL	Analyze within 28 days
CLP-Volatiles	Soil	8 ounce Glass Jar with Teflon-lined septa	Chill, 4°C	Analyze within 10 days
	Water	(3)40 ml VOA vials with Teflon-lined septa	Chill, 4°C pH<2, HCl	Analyze within 10 days

TABLE 2-3
SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

Analytical Method	Sample Matrix	Container Size/ Material	Sample Preservation	Holding Time
CLP-Semivolatiles	Soil	8 ounce Glass Jar with Teflon-lined septa	Chill, 4°C	Extract within 10 days, Analyze within 40 days
	Water	(2) One Liter Glass Amber Jars with Teflon-lined septa	Chill, 4°C	Extract within 5 days, Analyze within 40 days
BTX EPA Method 5030/8020	Soil	8 ounce Glass Jar with Teflon-lined septa	Chill, 4°C	Analyze within 14 days
	Water	(3) 40 ml vials with Teflon-lined septa	Chill, 4°C pH<2, HCl	Analyze within 14 days
Organochlorine Pesticides/PCBs EPA Method 8080	Soil	8 ounce Glass Jar	Chill, 4°C	Extract within 7 days, Analyze within 40 days
	Water	2.5 Liter Glass Amber Jar	Chill, 4°C pH between 5 & 9	Extract within 7 days, Analyze within 40 days
Cyanide, Total EPA Method 9010	Soil	8 ounce Glass Jar	Chill, 4°C	Analyze within 14 days
	Water	500 ml HDPE bottle	Chill, 4°C pH>12, NaOH	Analyze within 14 days
Unfiltered Metals EPA Method 6010 and/or 7000 Series	Soil	8 ounce Glass Jar	Chill, 4°C	Analyze within 180 days
	Water	500 ml HDPE bottle	pH<2, HNO_3	Analyze within 180 days

Note: for soil matrices, samples required for multiple analyses may be obtained from a single 8-ounce container. Holding time begins immediately upon collection of sample.

Each sample will be identified by a sample label as shown in Figure 2-10. When sample containers are filled at a site, the proper forms will be completed, and the samples prepared and shipped to the laboratory. DERA-funded samples for the RFI will be shipped separately from UST-investigation samples so that analytical costs may be tracked separately.

SITE NAME	DATE
ANALYSIS	TIME
	PRESERVATIVE
SAMPLE IDENTIFICATION	
PROJECT NUMBER	

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FIGURE 2-10
SAMPLE CONTAINER LABEL

DATE: 04/17/92 | DWG NAME: CLNSBL

2.9.1 Sample Chain-of-Custody

EnSafe/Allen & Hoshall will follow chain-of-custody procedures in accordance with NEESA 20.2-047B, Chapter 3.8, and corporate Standard Operating Procedures for chain-of-custody. EnSafe/Allen & Hoshall will use chain-of-custody forms, such as the one illustrated in Figure 2-11, for transferring sample shipments to the laboratory. Documentation of all samples will also be kept in a project field logbook. The common carrier package bill number will be documented on the chain-of-custody form and in the field logbook.

Upon transfer of custody, the chain-of-custody form will be signed by the EnSafe/Allen & Hoshall field sampling team leader, including the date and time the samples were relinquished. Because common carriers will not sign chain-of-custody forms, the chain-of-custody records will be sealed within each shipping container. All chain-of-custody forms received by the laboratory must be signed and dated by the laboratory sample custodian and returned to EnSafe/Allen & Hoshall following receipt or as part of the data reporting package. Separate chain-of-custody forms will be used for RFI samples so their costs may be separated from UST investigation costs.

2.9.2 Field Records

EnSafe/Allen & Hoshall personnel shall use only bound field logbooks for the maintenance of field records. Bound logbooks such as surveyors' logbooks are acceptable, as long as pages cannot be removed without tearing them out. Waterproof paper is preferred.

A logbook should be dedicated to an individual project. The field sampling team leader and all other team member names, project name and project code should be entered on the inside of the front cover of the logbook. All entries should be dated and recorded. At the end of each day's activity, or at the end of a particular event if appropriate, a sampling team member should draw

FIGURE 2-11
CHAIN OF CUSTODY RECORD

LABORATORY: _____

ATTENTION: _____

PROJECT NO.: _____

PAGE___ of____

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CLIENT NAME / COLLECTED BY							#of containers	MEDIA (X)				SAMPLE ANALYSIS (X)									REMARKS
SAMPLE ID	DATE	TIME	comp	grab	well	SAMPLE LOCATION		SOIL	WATER	SEDIMENT	GROUNDWATER										

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	RELINQUISHED BY:	DATE	TIME	RECEIVED BY:

RELINQUISHED BY:	DATE	TIME	RECEIVED AT LAB BY:	DATE	TIME	REMARKS

CLENCUS1

a diagonal line at the conclusion of the entry and initial indicating the conclusion of the entry or the day's activity.

All aspects of sample collection and handling as well as visual observations shall be documented in the field logbooks. Sample collection equipment (where appropriate), field analytical equipment, and equipment utilized to make physical measurements shall be identified in the field logbooks. Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment shall also be recorded in the field logbooks. Field analyses and measurements must be traceable to the specific piece of field equipment used and to the field sampling team member(s) collecting the sample, making the measurement, or analyses. Well abandonment procedures, where necessary, will be recorded and documented.

All entries in field logbooks shall be dated, legible, and contain accurate and inclusive documentation of an individual's project activities. Because field records are the basis for later written reports, language should be objective, factual, and free of personal feelings or other terminology which might prove inappropriate. Once completed, these field logbooks become accountable documents and must be maintained as part of project files.

2.9.3 Document Control

The term *document control* refers to the maintenance of investigation project files. Project files shall be maintained by the appropriate Task Order Manager. Documents as outlined below shall be kept in project files. EnSafe/Allen & Hoshall personnel may keep their own files. However, all official and original documents relating to investigations shall be placed in the official project files.

The following documents shall be placed in the project file:

- A copy of the study plan.
- Original Chain-of-Custody Records and bound field logbooks.
- A copy of the Receipt for Sample Forms.
- All records obtained during the investigation.
- A complete copy of the analytical data and memorandums transmitting analytical data.
- All official correspondence received by or issued by EnSafe/Allen & Hoshall relating to The investigation including records of telephone calls.
- One copy of the draft report (without review comments).
- One copy of the final report and transmittal memorandum(s).
- Any other relevant documents related to the original investigation or follow-up activities related to the investigation.

Under no circumstances are any personal observations or irrelevant information to be filed in the official project files. The Task Order Manager or Site Project Manager shall review the file at the conclusion of the project to ensure that it is complete.

2.10 Calibration Procedures and Frequency

The analytical laboratory will perform analytical instrument calibration in accordance with NEESA 20.2-47B (and specific instrument methods by reference). Adherence to proper calibration procedures will be determined by the NCR during the onsite laboratory inspection.

EnSafe/Allen & Hoshall plans to calibrate field equipment such as pH and temperature meters and PIDs according to their manufacturer's standard operating procedures. Field equipment for which SOPs are not in force will be calibrated and operated in accordance with the

manufacturer's recommendations. Field instruments will be calibrated at the beginning and end of each work day.

2.11 Analytical Procedures

This investigation will follow the analytical procedures described below.

2.11.1 Field Analyses

Soil sample screening will be performed as outlined in Section 2.6.1 of this QAP. Static water level measurements will be performed on all monitoring wells subsequent to well development with adequate time allowed for well recharge. In addition, pH, temperature, and conductivity will be measured in the field for each water sample collected. Oxidation-reduction potential and/or turbidity of the water samples may also be measured in the field.

Monitoring well casing (tops) will be surveyed (spatial and horizontal orientation) by a State of Tennessee Registered Land Surveyor. The survey measurements will be recorded relative to the USGS NAD '27 system. All field measurements will be recorded in a dedicated field logbook and/or appropriate EnSafe/Allen & Hoshall field activity log (e.g., boring log, well construction log, etc.).

2.11.2 Laboratory Analyses

Soil and groundwater samples will be analyzed for Total Petroleum Hydrocarbons (TPH) using the Gasoline Range Organics (GRO) Method specified by the TDEC and for Total BTX (EPA Method 5030/8020). DERA-funded samples for the RFI investigation will be analyzed for volatile organic compounds (CLP), semivolatile organic compounds (CLP), PCB/pesticides (8080), RCRA Appendix IX total metals (6010/7000 series), and TPH (GRO).

2.12 Data Reduction, Validation, and Reporting

Laboratory procedures for data reduction, validation, and reporting will be conducted according to standard operating procedures as dictated by the requirements of NEESA 20.2-047B, Chapter 7 — Analytical Methods and Chapter 8 — Maintaining Laboratory Approval. The specific procedures for data reduction, validation and reporting will be outlined as Level C QC data in NEESA 20.2-047B, and the NCR-approved laboratory QA Plan. Required internal QC checks and data validation procedures are described in Section 2.13.

EnSafe/Allen & Hoshall's use of the laboratory will be accomplished by a services agreement. This contract will specify the scope of services to be performed by the laboratory, the specific analytical quality assurance requirements to be met, and the information to be developed and reported.

2.13 Field and Laboratory Quality Control Checks

Internal laboratory control checks used by the laboratory will be conducted in the laboratory by the laboratory staff. EnSafe/Allen & Hoshall will conduct internal quality control checks of sampling procedures and laboratory analyses. These checks will consist of preparing and submitting sampling equipment rinsate blanks, trip blanks, field blanks, and field duplicates for analysis, and evaluating the laboratory analytical package. The data validation and classification checklists, included as Appendix C, will be used as guides in evaluating data collection, field records, and analytical performance. These checklists will aid in identifying valid data and classifying the data into one of three use categories: unusable data, Class A (qualitative) data, or Class B (qualitative and quantitative) data.

The types and frequency of blank and other control check samples will be dictated by the level of QC selected for each project. The required control check sample frequencies are outlined in

NEESA 20.2-047B, Chapter 3 — Site-Specific QC Requirements and Chapter 7 — Analytical Methods. For Level C QC, quality control measures can be discussed for sampling and analysis as follows.

2.13.1 Field Data Quality

Field work will be conducted and/or supervised by EnSafe/Allen & Hoshall personnel to ensure that proper procedures are followed. Field records will be kept of all activities that take place during the investigation and these records will be maintained at the EnSafe/Allen & Hoshall office in Memphis, Tennessee. These records will include any obstacles that may be encountered during the investigation.

Field samples will be collected per the procedures outlined in Sections 2.6 and 2.8. Precision will be assessed by evaluating the results of duplicate and matrix spike duplicate samples. Accuracy will be assessed by evaluating the analyses of field blanks, trip blanks, laboratory matrix and surrogate spikes, and laboratory reagent blanks and blank spike samples.

A **duplicate** is a sample identical to the original, collected from the same location (e.g., well) at the same time under identical conditions. Duplicate samples are analyzed along with the original sample to obtain sample procedure precision and inherent sample source variability. Due to the potential for loss of volatile constituents during preparation of soil samples, soils which are to be analyzed for volatiles will not be homogenized in the field. In accordance with TDEC guidelines, one duplicate sample will be collected during each sampling event. A duplicate sample for each matrix will also be collected for the DERA-funded RFI analyses. The same samples used for field duplicates shall be split by the laboratory and used as the laboratory duplicate or matrix spike. This means that for the duplicate sample, there will be analyses of the normal sample, the field duplicate, and the laboratory matrix spike/spike duplicate.

Special Note: Field sampling personnel will need to coordinate with the laboratory in advance to ensure that sufficient QC sample volumes are collected and that QC samples are numbered in a manner that is compatible with the laboratory sample tracking system (to prevent misidentification of samples).

A **field blank** is a sample container filled with the source water used in the decontamination of equipment in the field. It is prepared, preserved and stored in the same manner as the other field samples. The field blanks are analyzed along with the field samples for the parameters of interest to check for contamination imparted to the samples by the final rinse water, sample containers, preservatives, or other sources. One field blank per water source per sampling event will be prepared. Field blanks will consist of either potable water, deionized or distilled water, or deionized, organic-free water.

Rinsate (or equipment) blanks are collected by retaining rinsate from sampling equipment. The equipment is rinsed with distilled water after full decontamination procedures have been performed. Rinsate samples are collected in the same type of container as the other field samples and preserved in the same manner. One rinsate sample will be collected for each analytical method during each week of the field investigation. The rinsate blank is analyzed along with the field samples for the parameters of interest to check for contamination imparted to the samples by the sampling equipment, containers, or other sources.

A trip blank is a sample container filled in the laboratory with organic-free water and transported unopened with the sample bottles. Upon return to the laboratory, it is opened and analyzed along with the field samples for volatile parameters of interest. Trip blanks for all volatile parameters will be submitted to the laboratory at a frequency of one per sample shipping cooler.

The collection frequencies for quality control sample collection are summarized in Table 2-4.

TABLE 2-4
QUALITY CONTROL SAMPLE COLLECTION FREQUENCIES

Quality Control Sample	Estimated No. of Samples To Be Collected
Trip Blank (volatiles only)	One per cooler UST Investigation-6; RFI Investigation-3
Rinsate Blank	One each from soil sampler and bailers per week UST-2 Soil/1 Water RFI-2 Soil/1 Water
Field Blank	One per sampling event per water source UST-3 Distilled/3 Potable RFI-3 Deionized, organic-free
Duplicates	One per matrix per sampling event UST-2 Soil/1 Water RFI-2 Soil/1 Water
Matrix Spike/Matrix Spike Duplicates	One per twenty samples per matrix (5%) UST-3 Soil/1 Water RFI-1 Soil/1 Water

2.13.2 Analytical Data Quality

Analytical data quality is assured through the use of NEESA guidelines for QA/QC as set forth in NEESA 20.2-047B. The guidelines include analysis and evaluation of matrix spikes.

Matrix spike samples are prepared by the laboratory to assess the accuracy of the analytical method relative to matrix effects. Matrix effects are those sample components which interfere with the analysis of the contaminant of concern. Analysis of matrix spike duplicates will provide a basis for determining method precision specific to the matrix under investigation. Precision is measured as Relative Percent Difference (RPD) between duplicate analyses and the matrix spike. Matrix spikes and matrix spike duplicates will be analyzed at a frequency of one per 20 samples per matrix.

2.13.3 Field Data Package

The field data package will include field records and measurements obtained at the site by EnSafe/Allen & Hoshall personnel in accordance with *SOUTHDIV Guidelines for Groundwater Monitoring Well Installation*, Parts 3.4 and 4.0 and NEESA 20.2-047B, Chapter 7.2 — Deliverables and NEESA 20.2-031A, Chapter 6 — Monitoring Well Data Record Requirements.

The package is validated by conducting the following:

- A review of field data contained on water and soil sampling logs for completeness. Failure in this area may result in the data being invalidated for litigation or regulatory purposes.

- A verification that field blanks, sampling equipment rinsate blanks, and trip blanks were properly prepared, identified, and analyzed. Failure in this area may compromise the analytical data package and result in some data being considered qualitative or invalid.

- A check on field analyses for equipment calibration and condition. Failure in this area may result in the field measurements being invalidated.

- A review of chain-of-custody forms for proper completion, signatures of field personnel and the laboratory sample custodian, and dates. Failure in this area may result in the data being invalidated for litigation or regulatory purposes.

The field data package will be reviewed by the project QA Officer for completeness and accuracy using the checklists in Appendix C.

2.13.4 Analytical Data Package

Validation of the analytical data package will be performed by the project QA Officer before submittal to the NCR. The validation steps will be performed by applying applicable EPA Laboratory Data Validation Functional Guidelines for Evaluating Organics and Inorganics Analyses (Technical Directive Document No. HQ-8410-01) and EPA precision and accuracy statements for the analytical methods employed. NEESA 20.2-047B, Chapter 7.3 guidelines will be applied to all Level C data validation procedures. An Analytical Data Validation Checklist (Appendix C) will be used for this purpose.

The analytical data package validation procedure includes review of the following:

- Comparison of the data package to the reporting level requirements designated for the project, to confirm completeness.

- Comparison of sampling dates, sample extraction dates, and analysis dates to check that samples were extracted and/or analyzed within the proper holding times. Failure in this area may render the data unusable.

- Review of analytical methods and required detection limits to verify that they agree with the QAP and the laboratory contract. Failure in this area may render the data unusable.

- Review of field and laboratory blanks will be done to evaluate possible contamination sources. The preparation techniques and frequencies, and the analytical results (if appropriate) will be considered.

- Evaluation of all blanks (rinsate blanks, field blanks, trip blanks, reagent blanks, method blanks, and extraction blanks) must confirm freedom from contamination at the specified detection limit. All blank contaminants must be explained or the data applicable to those blanks labeled suspect and sufficient only for qualitative purposes.

2.13.5 Data Classification

The data will be classified by the project QA Officer based upon the level of reportables and the result of evaluating the field and analytical data packages. Three possible data classes are:

Unusable data: Data that may not be used for any purpose.

Class A data: Data that meets only the Class A screening criteria contained in Appendix C, but not the Level B criteria. This class of data may be used for qualitative purposes only, i.e., to help develop or refine study plans, evaluate different sampling or analytical techniques, or identify gaps in the database. For this investigation, data will be considered Class A if all documentation identified by checklists in Appendix C and the QAP have been properly prepared and are available.

Class B data: Data that meets both the Class A and Class B screening criteria. In addition to qualitative uses, the data submitted may also be used for quantitative purposes such as evaluating conditions such as risks or potential remedial solutions. For this investigation, data will be considered Class B if all analytical and field QC samples (rinsates, blanks, and spikes) are within acceptable control limits.

As with the laboratory data validation, the classification of data is based on specifically defined criteria. Samples are evaluated by matrix against the specific class criteria and judged as acceptable, provisional, or unacceptable. The following judging criteria may be applied to both Class A and Class B data:

A - Acceptable: All criteria have been successfully met for all samples.

P - Provisional: Some samples have not fully met the criteria but the information can be obtained.

U - Unacceptable: Criteria have not been met with any samples and cannot be obtained. This data may not be classified for use unless enough other data criteria have been met and scientific judgement indicates the data may be useful if classified.

N - Not Applicable

Data will be classified using the Data Classification Summary Checklist (Appendix C). A report of the results of the data validation for both previously collected and planned data will be submitted to the Task Order Manager.

2.14 Performance and System Audits

Audits will be performed before and during the work to evaluate the capability and performance of the entire system of measurement and reporting, i.e., experimental design, sampling (or data collection), analysis, and attendant quality control activities.

2.14.1 Field System Audits

The Site Project Manager is responsible for evaluating the performance of field personnel and general field operations and progress. The Site Project Manager will observe the performance of the field operations personnel during each kind of activity such as water-level readings and sampling rounds. A formal systems audit of field operations personnel by the corporate QA officer will be performed on a biannual basis and a field audit report for each sampling team member will be maintained on file by EnSafe/Allen & Hoshall. Where applicable, these audits will ensure that field operations are being conducted in accordance with NEESA 20.2-031A guidelines.

2.14.2 Laboratory Systems Audit

A laboratory systems audit is conducted at least annually by EnSafe/Allen & Hoshall. These audits test methodology and assure that systems and operational capability is maintained. They also verify that quality control measures are being followed as specified in the laboratory written standard operating procedures and Quality Assurance Plans. The Systems Audit Checklist used by the EPA Contract Laboratory Program (CLP) forms the procedural basis for conducting these audits.

Laboratory initiated audits will be conducted in accordance with guidelines set forth in NEESA 20.2-047B, and the laboratory QA Plan as approved by the NCR. Under NEESA 20.2-047B guidelines, the project NCR is also responsible for laboratory inspections to ensure compliance with NEESA laboratory requirements.

2.14.3 Performance Evaluation Audits

A performance evaluation (PE) audit evaluates a laboratory's ability to obtain an accurate and precise answer in the analysis of known check samples by a specific analytical method.

Following the analytical data validation described in Section 2.11, a performance evaluation audit of the laboratory may be conducted by EnSafe/Allen & Hoshall. This audit may be conducted if it is determined that the quality assurance data provided are outside acceptance criteria control limits. PE audits may include a review of all raw data developed by the laboratory and not reported (laboratory non-reportables) and the submission of blind spiked check samples for the analysis of the parameters in question. These check samples may be submitted disguised as field samples (the laboratory will not know the purpose of the samples), or the samples may be obvious (known) check samples that are EPA or National Bureau of Standards (NBS) traceable.

PE audits may also be conducted by reviewing the laboratory's results from round-robin certification testing and/or EPA CLP evaluation samples. An additional component of PE audits includes the review and evaluation of raw data generated from the analysis of PE samples and actual field samples that may be in question.

2.14.4 Regulatory Audits

It is understood that EnSafe/Allen & Hoshall field personnel and subcontract laboratories are also subject to quality assurance audits by the EPA and the NCR. The NCR (under NEESA guidelines) will conduct laboratory inspections prior to approval for participation in any NEESA project, and will provide performance samples to the laboratory for approval purposes.

2.15 Preventive Maintenance

The sampling equipment employed by EnSafe/Allen & Hoshall during an investigation that may require preventive maintenance will be checked for proper operation before and after each use on a daily basis. These checks will be conducted at the beginning and end of each day. Any replacements or repairs will be made as needed in accordance with manufacturer's instructions.

Equipment or instruments potentially requiring preventive maintenance are listed in Table 2-5 along with the preventive maintenance requirements for each. The actual manufacturer or model number for each instrument may vary depending upon what equipment is available when the field investigation is implemented.

TABLE 2-5
FIELD TESTING EQUIPMENT

Item	Manufacturer	Model Number	Preventive Maintenance
pH Meter	Fisher	Accumet 956	Manufacturer's Operating Manual
Thermometer	---	Platinum RTD	" "
Conductivity/ pH/Temperature Meter	YSI	3500	" "
Photoionization Detector	HNU Photovac	HW-101 TIP-II	" " " "

Records of calibration and maintenance activities for each piece of equipment are contained in logbooks assigned to the equipment. Preventive maintenance to be performed by the analytical laboratory will be performed in accordance with laboratory SOPs as established in an NCR-approved QA Plan. Preventive maintenance procedures for field groundwater screening equipment to be used during the monitoring project are described below.

Preventive Maintenance for Field Equipment

Conductivity Meters

Each Use: Meter probes are cleaned before and after each use with distilled or deionized water.

Before and after each use (daily) the instruments are checked with a commercial conductivity standard for proper calibration.

The battery is checked for proper charge.

Quarterly: The instrument is inspected on a quarterly basis, whether used during the quarter or not. The inspection consists of a general examination of the electrical system (including batteries) and a calibration check.

Instruments not functioning properly are shipped to the manufacturer for repair and calibration.

pH Meters

Each use: Before each use (daily), the probe should be checked for cracks in the electrode bulb and to make sure it is completely filled with electrolyte solution. At the beginning and end of any sampling day, the pH meter must be calibrated using two standard pH buffers bracketing the suspected pH range (e.g., 4 - 7 standard units or 7 - 10 standard units).

The battery is checked for proper charge. Following each use, the probe is rinsed with deionized or distilled water. The probe cap is filled with electrolyte solution and placed on the probe tip. Excess electrolyte is rinsed off and the probe dried with a paper towel. The instrument is then placed in its carrying case.

Quarterly: The instrument is inspected on a quarterly basis whether or not it has been used.

The inspection consists of a general examination of the probe, wire, electrical system (battery check) and a calibration check.

Any malfunctioning equipment is returned to the manufacturer for repair and recalibration.

Thermometers

Each use: Before each use, thermometers are visually checked for cracks and mercury separation.

After use, thermometers are rinsed with deionized or distilled water and placed in their protective case to prevent breakage.

Monthly: Thermometers are visually inspected as described above, whether used or not.

Annually: They are checked against an NBS-certified thermometer for accuracy.

2.16 Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

Precision is an estimate of the reproducibility of a method, and is estimated by several statistical tests: the standard deviation of the error distribution, the coefficient of variation and the relative percent difference between replicate (duplicate) samples. EnSafe/Allen & Hoshall will determine the precision of a method by analyzing replicate data.

Precision is then defined by the coefficient of variation (CV), which expresses the standard deviation as a percentage of the mean. An indicator of CV, relative percent difference will serve as quality criterion for classification of data resulting from this investigation. Specific statistical comparison of duplicate samples (field and laboratory), as a measure of precision evaluating both sample collection procedures and laboratory instrument performance, may be accomplished by first comparing the obtained duplicate results with the published EPA criteria for method precision (relative percent difference).

The accuracy of a method is an estimate of the difference between the true value and the determined mean value. Specific statistical comparison of percent recovery values reported by the laboratory as a measure of method accuracy will be compared with the published EPA (or other appropriate regulatory entity) criteria for the accuracy of an individual method.

Data completeness will be expressed both as the percentage of total tests conducted and required in the scope of work that are deemed valid. Methods for assessing data precision, accuracy, and completeness by the laboratory will be outlined in the approved laboratory QA Plan.

2.17 Corrective Action

During the course of any investigation, field personnel are responsible for seeing that field instruments and equipment are functioning properly and that work progresses satisfactorily. The field personnel are also responsible for ensuring performance of routine preventive maintenance and quality control procedures, thereby ensuring collection of valid field data. If a problem is detected by the field personnel, the Task Order Manager shall be notified immediately, at which time problem correction will begin. Similarly, if a problem is identified during a routine audit by the project QA officer or the regulatory QA officer (or NCR), an immediate investigation

will be undertaken and corrective action deemed necessary will be taken as early as possible.

If corrective action is required by the analytical laboratory, it should be conducted in accordance with their NCR-approved QA Plan following guidelines provided in NEESA 20.2 — 047B, Chapter 4.5 — Out-of-Control Events.

2.18 Quality Assurance and Project Reports

The laboratory is required to submit a monthly QC progress report to the NCR. EnSafe/Allen & Hoshall will provide a data quality assurance summary (QC Data Report) within the draft EAR for submittal to the NCR. A draft EAR will be submitted to the SOUTHDIV EIC within 20 working days after receipt of analytical results from the laboratory. Assuming there are no unexpected delays, submittal will be approximately 60 days from the startup of field work.

A final EAR and draft Corrective Action Plan (CAP) will be prepared for submittal to SOUTHDIV and the TDEC within 10 working days following comments from SOUTHDIV. A final EAR/CAP will be submitted to SOUTHDIV within 10 working days of receipt of comments from the TDEC.

3.0 SITE HEALTH AND SAFETY PLAN

3.1 Introduction

The following Health and Safety Plan is written in conjunction with the Environmental Assessment Plan (EAP) to be implemented at the Aircraft Firefighting Training Facility (AFFTF) underground storage tank (UST) site, Naval Air Station (NAS) Memphis, Millington, Tennessee. The project contract number is N62467-89-D-0318.

Project Objective

The objective of the EAP is to define the vertical and lateral extent of contamination, if any, of the shallow soil zone and water table aquifer resulting from a leak in tank systems 1489 and 1508. The EAP is designed to produce data of technical quality to assess the current site conditions and to determine if contamination is present and if corrective action is needed.

The objective will be accomplished by completing a series of shallow soil borings and installing up to eleven shallow monitoring wells. Soil samples will be collected during the drilling of all soil borings, and groundwater samples will be collected from all completed monitoring wells. Selected samples will be submitted for laboratory analyses.

Site Description

The site under investigation is the area surrounding USTs 1489 and 1508 located adjacent to fire mats 305 (east) and 392 (west). The east mat has three 1,800 USTs for storage of JP-4 fuel, while the west mat has one 5,000-gallon JP-4 UST. A tank tightness test conducted on July 2, 1991 indicated that the west tank (1508) and one of the east tanks (1489) were leaking. The condition of these tanks was reported to the TDEC on July 3, 1991 and the two tanks were taken out of service. The amount of fuel released is not known.

Waste fuel and water drains from the fire mats to an oil/water separator where the separated JP-4 fuel is pumped back to fire MAT 305 and burned during training exercises. Prior to 1977, the water-fuel-foam mixture from training activities routinely overflowed onsite. There have been several documented releases since 1977 including explosions in drain lines and overflows of the oil/water separator. It is believed that waste oils and solvents were burned with the fuel in the past, therefore it is possible that contaminants other than petroleum may be present (solvents, metals, etc.).

Seven release detection wells were installed adjacent to the tanks in December 1989. Three of these wells are located around the west tank. The other four wells are located at each corner of the tank pit for the three east tanks. According to the logs for these wells (Appendix A), the water table was at approximately 13 feet below ground surface at the time of their installation. The wells have never been sampled.

Applicability

The provisions of the plan are mandatory for all onsite personnel engaged in the environmental assessment who will be exposed or have the potential to be exposed to onsite hazardous substances. All personnel will operate in accordance with the most current requirements of 29 CFR 1910.120, *Standards for Hazardous Waste Workers and Emergency Responders*. These regulations include the following provisions for employees exposed to hazardous substances, health hazards or safety hazards: training as described in 120(e), medical surveillance as described in 120(f), and personal protective equipment described in 120(g). All field personnel assigned to field activities for the project must read this plan and sign the plan acceptance form before the start of site activities. At a minimum, all provisions of the E/A&H health and safety plan will be followed.

E/A&H will suspend the site work and will instruct the subcontractor to evacuate the area under the following conditions:

If inadequate safety precautions are taken by the subcontractor or DOD oversight personnel

or

If it is believed that the subcontractor or DOD oversight personnel are or may be exposed to an immediate health hazard.

Health and Safety training certificates for all E/A&H employees who may visit the site are provided in Appendix D. Current OSHA refresher training certificates will be available onsite for all employees involved in field activities whose refresher course requirements come up for renewal before the project begins.

3.2 Site Characterization

3.2.1 Work Areas

Site control will be established and maintained according to the recommendations in the EPA's *Interim Standard Operating Safety Guides*, Revised September, 1982. Three general zones of operation will be established to reduce the potential for contaminant migration and risk of personnel exposure:

- The exclusion zone.
- The contamination reduction zone.
- The support zone.

The exclusion zone will be located around the immediate area of each activity taking place. The contamination reduction zone will include the decontamination station and the support zone will be located beyond the contamination reduction zone. Only authorized personnel with a minimum

of 40 hours health and safety training meeting the requirements of OSHA 29 CFR 1910.120 are permitted within the exclusion and contamination reduction zones.

The exclusion zone will be the area 20 feet within either side or the rear of the drill rig. All personnel within the exclusion zone must use the prescribed level of personal protection. A checkpoint will be established at the edge of the exclusion zone to regulate the flow of personnel and equipment into and out of the area. The exclusion zone boundary is the hotline. All personnel crossing the hotline into the exclusion zone must use the buddy system.

The person entering the exclusion zone must be accompanied by a person who is able to:

- Provide his or her partner with assistance.
- Observe his or her partner for signs of chemical or heat/cold exposure.
- Periodically check the integrity of his or her partner's protective clothing.
- Notify the Field Project Manager, his representative, or others if emergency help is needed.

When Level B PPE is required, at least one person shall remain outside the exclusion zone and have available at least the same level of personal protective equipment (PPE) as the buddies who are entering the exclusion zone. The person outside the exclusion zone will act as the safety observer and ensure that the work area access/egress requirements (Subsection 3.2.2) are followed.

The contamination reduction zone serves as a buffer between the exclusion zone and the support zone and is intended to prevent the spread of contaminants from the work areas. All decontamination procedures will be conducted in this area. Personnel will leave the support zone and enter the contamination reduction zone through a controlled access point. They must

wear the prescribed personal protective equipment. Exiting the contamination reduction zone requires the removal of all contaminants through compliance with established decontamination procedures.

The support zone is the outermost area and is considered a non-contaminated or clean area. The support area will be equipped with an appropriate first-aid station and equipment to perform gross decontamination of equipment.

3.2.2 Work Area Access/Egress

All personnel entering the site exclusion zone must:

1. Check in with the E/A&H Field Project Manager or representative.
2. Provide the Field Project Manager with the following information:
   - The names of individuals entering the site work area.
   - Activity to be performed at that location.
   - Duration of the planned activity.
3. The Field Project Manager will inform persons entering the site work area of the location of other activities taking place during the scheduled entry. If the Field Project Manager determines it is not safe for the scheduled entry, he or she can reschedule the entry or stop all other activities to perform the specific task.
4. When leaving the site work area, proceed directly to the decontamination station and check out with the Field Project Manager or his representative. All exits from the site work area must be made through the decontamination station.
5. Perform all necessary decontamination before leaving the decontamination station.

3.2.3 Site Map and Work Zones

The location of the work area is shown on Figure 3-1, Site Map. The specific locations of the work zones are indicated on Figure 3-2, Work Zones. The limit of the exclusion area and location and limit of the decontamination corridor and support area is based on prevailing wind direction and existing physical assets such as location of utilities, roads, and security assets. Figure 3-3 is the annual wind rose for the NAS Memphis area.

3.3 Site Activities

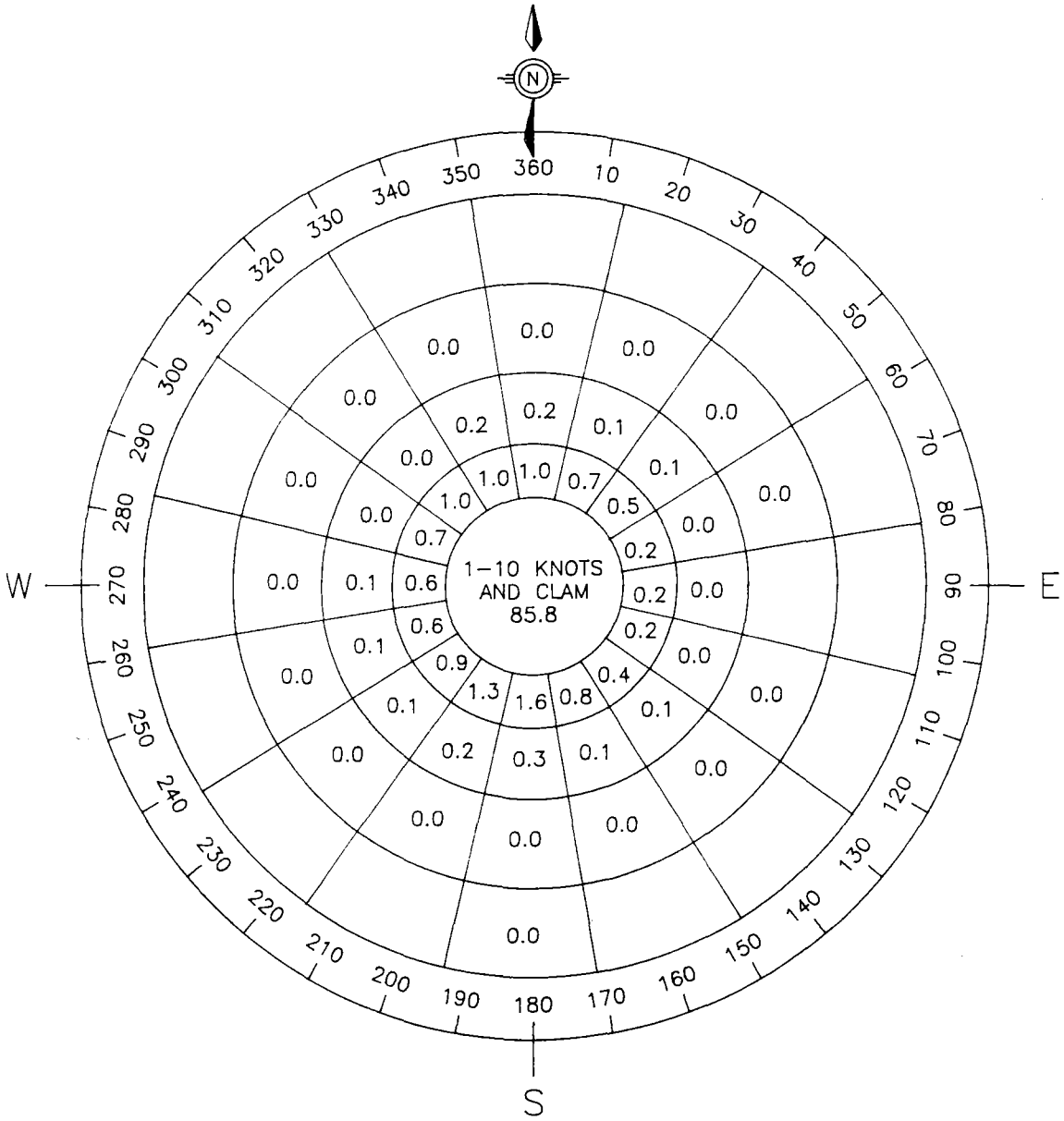
The activities to be performed during the investigation include soil gas sampling and the drilling and sampling of up to twenty borings. Up to 11 soil borings will be completed as shallow groundwater monitoring wells. Subsequent activities will include well purging, development, and sampling as required. Boring/well installations and associated field work are described in Section 1.0.

3.4 Hazard Evaluation

The underground storage tank (UST) investigation will provide data needed to assess the extent of contamination at this site, and to determine if follow-up action (i.e., cleanup or monitoring) is required to maintain compliance with environmental regulations. The investigation will focus around the USTs located at the Aircraft Firefighting Training Facility, MATs 305 and 392. The USTs at the facility include three 1,800-gallon and one 5,000-gallon steel storage tanks used to store JP-4 fuel. A tank tightness test performed on the two tanks indicated that the tanks were leaking.

3.4.1 Chemical Hazards

JP-4 fuel is a colorless flammable liquid, with a fuel oil-like odor. Symptoms of exposure include irritation of skin and eyes, respiratory irritation caused by inhalation, and irritation of the stomach caused by ingestion.



UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 3-3
WIND ROSE
NAS MEMPHIS

DATE: 04/17/92 | DWG NAME: NASMEM20

Flammable vapors from petroleum products and flammable gases present the additional hazard of fire or explosion. All lights, test instruments and other electric equipment must be explosion proof or intrinsically safe if operated in areas previously identified as containing flammable gases. Open flames and smoking are not permitted. Additional chemical information is included in Appendix E.

3.4.2 Heavy Equipment Operations

Self-propelled equipment such as drill rigs and trucks must be inspected by the subcontractor and the equipment operator before being placed in operation. Defects that affect safety will be corrected in a timely manner to prevent a hazard to humans. When defects make continued operation hazardous to humans, the defective equipment will be taken out of service. A tag indicating that the equipment shall not be operated, nor the tag removed, shall be placed in a conspicuous location on the equipment. The tag shall remain in place until it is demonstrated to the individual tagging the equipment that it is safe to operate.

Defects that affect safety will be reported to the E/A&H site representative if they are not corrected immediately. The site representative will keep a record in the official site log that will include the date the defect was reported, the identification of the piece of equipment, a description of the defect, and the date of repair.

Operators of self-propelled mobile equipment will maintain control of the equipment while it is in motion. Speed will be consistent with conditions of roadways, grades, clearances, visibility, and traffic and the type of equipment used. Equipment will be operated at speeds that permit stopping and maneuvering in the tight work area determined by the site topography and layout.

Humans will **not** be transported:

- In or on dippers, clamshells or buckets.
- In beds of mobile equipment.
- On top of loads in mobile equipment.
- Outside cabs, equipment operators stations, and beds of mobile equipment.
- To or from work areas in overcrowded equipment (i.e., the vehicle will not carry more persons than the number of seats on that vehicle).

All self-propelled mobile equipment will have a service brake system capable of stopping and holding the equipment with its typical load on the maximum grade it travels. (This does not apply to equipment that was not originally equipped with brakes). If equipped, the parking brake on self-propelled mobile equipment will be capable of holding the equipment under typical load conditions on the maximum travel grade. All braking systems installed on self-propelled mobile equipment will be maintained in a functional condition.

Repair or maintenance of equipment will be performed only after the power is off and the equipment blocked against hazardous motion. Starting or moving the equipment is allowed for adjusting or testing, provided that precautions are taken to protect the people involved.

Seat belts will be provided and worn in all site vehicles. They will be maintained in functional condition and replaced when necessary to assure proper performance. Furthermore, seat belts will meet the requirements of SAE J386, *Operator Restraint Systems for Off-Road Work Machines*, (1985).

Mobile equipment will not be left unattended unless the controls are placed in the park position and the parking brake, if provided, is set, and the ignition turned off. Persons will not work

on top of, under, or from mobile equipment in a raised position until the equipment has been blocked or secured to prevent it from rolling or falling accidently.

All mobile drill rigs will be moved only when the drill rig boom is in the down position. Care will be taken to locate all overhead power lines before raising the drill rig boom. Under no circumstances, should the drill rig boom (or any other part of it) be positioned within 10 feet of exposed and energized electrical wires. The drill rig operator will be sure that there is enough overhead clearance before raising the drill rig through careful planning, (i.e., the drill rig will not hit or touch any overhead obstruction when raised, nor will it hit or touch any object while being raised).

3.4.3 Physical Hazards During Operations

Personnel conducting drill rig operations shall keep clear of all moving parts. Loose clothing shall not be worn because it could become entangled in the drill rig. When conducting operations or survey work on foot, personnel will walk at all times. Running greatly increases the probability of slipping, tripping, and falling. When working in areas that support habitat for poisonous snakes, personnel shall wear protective chaps made of a heavy material designed to prevent snake bites to the legs.

Drilling may be conducted in areas which contain underground utilities of unknown location. NAS Memphis Public Works Department (PWD) personnel shall be responsible for issuing a drilling permit and locating all utilities in the investigation area. If PWD personnel are unsure of utility locations, precautionary measures may include boring the first 2 to 4 feet with a hand auger before using the drill rig.

3.5 Employee Protection

Employee protection for this project includes standard safe work practices, personal protective equipment, procedures and equipment for extreme weather conditions, work limitations, and exposure evaluation.

3.5.1 Standard Safe Work Practices

Standard safe work practices that will be followed include:

- Eating, drinking, chewing gum or tobacco, smoking or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the Site Health and Safety Officer.
- Hands and face must be thoroughly washed upon leaving the work area.
- No contact lenses will be worn in work areas while invasive actions are conducted.
- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.
- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate or discolored surfaces; or lean, sit, or place equipment on drums, containers, or on soil suspected of being contaminated.
- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation or ingestion of toxic substances exists unless specifically approved by a qualified physician. Consumption of alcoholic beverages shall be avoided during operations.
- Due to the possible presence of overhead power lines, adequate side and overhead clearance should be maintained to ensure that the drill rig boom does not touch or pass close to any overhead lines.

- Due to the possible presence of underground utilities (including electric, natural gas, water, sewer, telephone, etc.), the activity and local utility representatives should be contacted and requested to identify all lines at the ground surface using characteristic spray paint or labeled stakes. A 3-yard buffer zone should be maintained during all subsurface investigations.

3.5.2 NAS Memphis General Rules of Conduct

- Liquor, firearms, cameras, narcotics, tape recorders, and other contraband items are not permitted on the premises.
- Any violation of local, state, or federal laws, or conduct which is outside the generally accepted moral standards of the community is prohibited.
- Violation of the Espionage Act, willfully hindering or limiting production or sabotage is not permitted.
- Willfully damaging or destroying property, or removing government records is forbidden.
- Misappropriation or unauthorized altering of any government records is forbidden.
- Securing government tools in a personal or contractor's tool box is forbidden.
- Gambling in any form, selling tickets, articles, taking orders, soliciting subscriptions, taking up collections, etc. is forbidden.
- Doing personal work in government shop or office, using government property or material for unauthorized purposes, or using government telephones for unnecessary or unauthorized local or long distance telephone calls is forbidden.
- Compliance with posted signs and notices is required.
- Boisterousness and noisy or offensive work habits, abusive language, or any verbal, written, symbolic, or other communication which tends to disrupt the work of others or morale is forbidden.

- Fighting or threatening bodily harm to another is forbidden.
- Defacing any government property is forbidden.
- Wearing shorts of any type and/or offensive logos, pictures, or phrases on clothing is forbidden. Shirts, shoes and pants or slacks or coverall-type garments will be worn at all times on government property.
- All persons operating motor vehicles will obey all NAS Memphis traffic regulations.

3.5.3 Personal Protective Equipment (PPE)

General Measures

A primary goal of E/A&H is the prevention of all occupationally related injuries and illnesses. The following practices are presented as general precautionary measures for reducing the risks associated with hazardous waste and spill operations. Failure to adhere to the measures will result in disciplinary action.

Personal Protection

- Be familiar with and knowledgeable about standard operating safety procedures.
- Be familiar with, knowledgeable about, and adhere to instructions in site safety plan.
- Identify and arrange for emergency medical assistance. The location, telephone number and transportation capabilities of the nearest emergency medical facilities should be known. For particularly hazardous operations, onsite medical facility alerted.
- Consider fatigue, heat stress and other environmental factors influencing efficiency of personnel.

Field activities which disturb soils will be initiated in Level D protection. Level D protection consists of full length sleeves and pants, hard hat, appropriate chemical resistant gloves (Neoprene), eye protection, and chemical resistant, steel-toed and steel-shank boots or

equivalent. This level of protection was chosen because contamination present at this site may present a skin absorption hazard.

Air monitoring for volatile organic compounds will be performed continuously during all sampling activities. Instruments will be continuous reading and intrinsically safe. Additional PPE upgrades to Level C will be initiated if airborne concentrations warrant respiratory protection. Level B will be initiated if concentrations of any contaminant exceeding 50 percent of the OSHA Permissible Exposure Limit (PEL) are encountered. See Table 3-1 for the specific criteria for use and equipment for each level of protection.

TABLE 3-1
LEVEL OF PROTECTION AND CRITERIA

Level of Protection	Criteria for Use	Equipment
Level A	• When atmospheres are "immediately dangerous to life and health" (IDLH in the NIOSH/OSHA Pocket Guide to Chemical Hazards or other guides.) • When known atmospheres or potential situations exist that would affect the skin or eyes or be absorbed into the body through these surfaces. Consult standard references to obtain concentrations hazardous to skin, eyes or mucous membranes. • Potential situations include those where immersion may occur, vapors may be generated or splashing may occur through site activities. • Where atmospheres are oxygen with the conditions above. • When the type(s) and or potential concentration of toxic substances are not known.	• Positive pressure-demand full facepiece self-contained breathing apparatus or positive pressure-demand supplied air respirator with escape SCBA • Totally-encapsulating chemical protective suite • Chemical-resistant inner and outer gloves • Steel toe and shank chemical resistant boots • Hard hat under suit • Two-way radios worn inside suit • Optionally: coveralls, long cotton underwear, disposable protective suit, gloves and boots, work over fully encapsulating suit

TABLE 3-1
LEVEL OF PROTECTION AND CRITERIA

Level of Protection	Criteria for Use	Equipment
Level B	• When work areas contain less than 19.5 percent oxygen • When concentrations of any contaminant exceed 50% of PEL	• Chemical resistant clothes, long sleeves, hooded, one or two pieces • Full-faced positive-pressure supplied air breathing apparatus or airline system with a 30 minute escape bottle • Hard hat • Inner gloves and chemical resistant gloves • Steel toe and shank boots • Optionally: coveralls and disposable outer boots
Level C	• When airborne particulates (dust) warrant respiratory protection • When work areas contain at least 19.5 percent oxygen	• Chemical resistant clothes, long sleeves, hood optional, one or two pieces • Full-faced piece, air purifying respirator equipped with cartridges suitable for the hazard • Hard hat • Inner gloves and chemical resistant gloves • Steel toe and shank boots • Coveralls and disposable outer boots
Level D	• When level B or C is not indicated • When airborne particulates do not warrant respiratory protection • When work areas contain at least 19.5 percent oxygen	• Inner gloves and chemical-resistant gloves needed to handle soil or water samples • Steel toe and shank boots • Hard hat (ANSI Z891-1969 standard) • Eye protection (ANSI Z87.1-1968) standard • Optionally: coveralls and disposable outer boots

Notes:

Level A protection will be selected when the highest available level of respiratory, skin, and eye protection is needed. Level A protection will be required in Area A of the exclusion zone.

Contraindications for use of Level A:

- Environmental measures contiguous to the site indicate that air contaminants do not represent a serious dermal hazard.
- Reliable, accurate historical data do not indicate the presence of severe dermal hazards.
- Open, unconfined areas.
- Minimal probability of vapors or liquids (splash hazards) present which could affect or be absorbed through the skin.
- Total vapor readings indicate 500 ppm to 1,000 ppm.

Level B protection will be selected when the highest level of respiratory protection is needed,but cutaneous exposure to the small unprotected areas of the body, (neck and back of head) is unlikely, or where concentrations are not known to be within acceptable standards. Additionally, the permissible limit for exposure to mixtures of all site gases will be checked using the requirements of 1910.1000(d)(2)(i) to ensure that PEL is not exceeded. If the value calculated using this method exceeds 1.0, Level B PPE is required.

Level C protection will be selected when the types and concentrations of inseparable material is know, or reasonably assumed to be no greater than the protection factors associated with air-purifying respirators, and exposure to the unprotected areas of the body is unlikely to cause harm.
Dust concentrations require Level C PPE, where the respirable fractions exceed the PEL of 5 mg/m3 or the total concentrations exceed the PEL of 15 mg/m3.

Level D protection will be chosen when measurements of atmospheric concentrations are at background levels and work functions preclude splashes, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemicals.

Selection of Personal Protective Equipment

For additional information on selection, use and maintenance, refer to the E/A&H *Health and Safety Manual.*

3.5.4 Procedures and Equipment for Extreme Weather Conditions

Field activities for this investigation are scheduled to last approximately 2 weeks. The seasonal climate can be expected to be hot. Heat stress will be of concern for the health and safety personnel. Adverse weather conditions are important considerations in planning and conducting site operations. Extremes in hot weather can cause physical discomfort, loss of efficiency and personal injury.

Heat Stress

Heat stress can result when the protective clothing decreases natural body ventilation even when temperatures are moderate. Working under various levels of personal protection may require

wearing low permeability disposable suits, gloves and boots which will prevent most natural body ventilation. Discomfort due to increased sweating and body temperature (heat stress) will be expected at the work site.

Heat stress is the metabolic and environmental heat to which an individual is exposed. The manifestations of heat strain are the adjustments made by an individual in response to the stress. The three most important categories of heat-induced illness are heat exhaustion, heat cramps, and heat stroke. These disorders can occur when the normal responses to increased sweat production are not adequate to meet the needs for body heat loss or when the temperature regulating mechanisms fail to function properly.

Heat exhaustion is a state of collapse brought about by an insufficient blood supply to the cerebral cortex portion of the brain. The crucial event is low blood pressure caused by inadequate heart output and widespread expansion of blood vessels.

Heat Exhaustion Factors — Factors which can lead to heat exhaustion are as follows:

- Increased expansion of blood vessels which causes a decreased capacity of circulation to meet the demands for heat loss to the environment, exercise, and digestive activities.
- Decreased blood volume due to dehydration.
- Reduced blood volume due to lack of physical training, infection, intoxication (from industrial contaminants as well as from drinking alcohol), or heart failure.

Heat Exhaustion Symptoms — The symptoms include extreme weakness or fatigue, dizziness, nausea, or headache. More severe cases may also involve vomiting and possible unconsciousness. The skin becomes clammy and moist, the complexion pale, and the oral

temperature stays normal or low but the rectal temperature is usually elevated (99.5°F - 101.3°F). Workers who are unacclimated run the highest risk.

Heat Exhaustion Treatment — In most cases, treatment of heat exhaustion is fairly simple. The victim will be moved to a cool place. If the victim is unconscious, medical assistance must be sought. Mild cases may experience immediate recovery; however, more severe cases may require several days care. No permanent effects have ever been reported.

Heat cramps result when the working muscles go into painful spasms. This may occur in those who perspire profusely in heat and who drink large quantities of water, but who fail to replace their bodies' low salt. It is the low salt content in the blood that causes the cramping. The abdominal muscles as well as the muscles in the arms and legs may be affected. The cramps may appear during or even after work hours. Persons on a low sodium diet should not be given salt. A physician must be consulted on the care of people with this condition.

Heat stroke is the most serious health problem that arises while working in hot environments. It is caused by the breakdown of the thermoregulatory system under stress. When this happens, perspiration stops and the body can no longer regulate its own temperature.

Heat Stroke Symptoms — A heat stroke victim may be identified by hot, dry, and usually red or spotted skin. The body core temperature can exceed 105°F. Mental confusion, irritability and chills are common. These are all early warning signs of heat stroke; if the sufferer is not removed from the hot environment at once, more severe symptoms can follow, including unconsciousness, delirium, and convulsions, possibly ending in death.

Heat Stroke Treatment — Heat stroke victims must be treated as a major medical emergency; medical assistance must be summoned immediately.

Additional treatment:

- First aid must be administered.
- Individual must be moved to a cool location.
- Individual must be cooled through wetting, fanning, or immersion.

Care should be taken to avoid over-cooling and treatment for shock by raising the legs. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

To reduce the potential for heat strokes:

- Drink plenty of fluids (to replace loss through sweating).
- Wear cotton undergarments to act as a wick to absorb moisture.
- Make adequate shelter available for taking rest breaks to cool off.

Additional Precautionary Measures

In extremely warm weather, the Site Health and Safety Officer may also require:

- Wear cooling devices to aid in ventilation. (NOTE: the additional weight may affect efficiency.)
- Install portable showers or hose down facilities to cool clothing and body.
- Shift working hours to early morning and early evening. Avoid the hottest time of the day.
- Frequently rotate crews wearing the protective clothing (if required).

3.5.5 Work Limitations

All site activities will be conducted during daylight hours only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional 8 hours of training in site management. All personnel must complete an 8-hour refresher training course on an annual basis in order to continue working at the site.

3.5.6 Exposure Evaluation

All personnel scheduled for site activities must have had a baseline physical examination of the neurologic, cardiopulmonary, musculoskeletal and dermatological systems, pulmonary function testing, multi-chemistry panel and urinalysis and have been declared fit for duty. An exposure history form will be completed for each worker participating in site activities. An examination and updated occupational history will be repeated on an annual basis and upon termination of employment as required by 29 CFR 1910.120(f). The content of the annual or termination examination will be the same as the baseline physical. A qualified physician will review the results of the annual examination and exposure data and request further tests or issue medical clearances as appropriate.

After any job-related injury or illness, there will be a medical examination to determine fitness for duty or any job restrictions. The site health and safety manager will review the results with the examining physician before releasing the employee for work. A similar examination will be performed if an employee has missed at least three days of work due to a non-job related injury or illness requiring medical attention. Medical records shall be maintained by the employer or the physician for at least 30 years following the termination of employment.

3.6 Monitoring Requirements

Air monitoring will be accomplished using an HNU (or similar) photoionization detector during all borings and groundwater well installations. The PID will be calibrated to measure volatile organic compounds relative to benzene using an isobutylene standard gas. Background (ambient) PID readings in the breathing zone will be collected before each day's field activities begin. This value will be recorded in the field logbook. If volatile organic compound concentrations (in the breathing zone) exceed background (ambient) readings by five ppm or more, field activities will immediately cease. At this point, the Field Project Manager must contact the Health and Safety Officer. The Health and Safety Officer will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary including upgraded personal protective equipment requirements, revised work schedules, and revised decontamination procedures.

Field technicians will be made aware that they must report any unusual odors or soil discolorations. Each instrument shall be calibrated daily before site activities begin and at the end of each day's work. At the end of each work day and before calibration, each instrument shall be checked to ensure that it is free from surface contamination.

Medical Monitoring Program

All Joint Venture (EnSafe/Allen & Hoshall) personnel who enter hazardous waste/spill sites or have the potential for exposure to hazardous materials from these sites must participate in the EnSafe/Allen & Hoshall Medical Monitoring Program as described in the E/A&H *Health and Safety Manual.*

3.7 Decontamination

A decontamination zone will be established and will include one area for sampling equipment and one area for personnel decontamination (if necessary).

3.7.1 Personnel Decontamination

The decontamination procedures, based on Level D protection, will consist of:

- Brushing heavily soiled boots and rinsing outer gloves and boots with soap and water.
- Removing outer gloves and depositing them in a plastic lined container.
- Hard hats and eye protection should also be washed thoroughly at the end of each work day with a soap and water solution.
- All field personnel are to be instructed to shower as soon as possible after leaving the site.

Decontamination procedures will be conducted at the lunch break and at the end of each work day.

If higher levels of personal protection equipment are needed, adjustments will be made to these procedures and an amendment will be made to this health and safety plan.

3.7.2 Closure of the Personnel Decontamination Station

Decontamination and rinse solutions (soap and water solutions) from sampling tool decontamination will be allowed to drain in onsite grassy areas. Reusable clothing will be dried and prepared for future use. All washtubs, pails, buckets, etc. will be washed, rinsed and dried at the end of each workday.

Soils produced during decontamination activities will be contained in 55-gallon drums along with drill cuttings and other soil waste produced during site activities. These soils will be

subsequently disposed of in accordance with TDEC guidelines for UST-contaminated soil (if applicable).

3.8 Authorized Personnel

Personnel anticipated to be onsite at various times during site activities include:

- EnSafe/Allen & Hoshall Principal-In-Charge - Dr. James Speakman
- EnSafe/Allen & Hoshall Task Order Manager - Mr. Lawson Anderson
- EnSafe/Allen & Hoshall Field Project Manager - Mr. Joe Matthews
- EnSafe/Allen & Hoshall Field Geologist - Mr. Joe Matthews
- EnSafe/Allen & Hoshall Site Health & Safety Officer - Mr. Rick Barlow
- SOUTHDIV Engineer-in-Charge - Mr. John Karlyk
- Naval Air Station Memphis Site Contact - Mrs. Tonya Barker
- Tennessee Department of Environment and Conservation (TDEC) - Mr. Hussein Ghelichkhani
- Drilling Subcontractor - To Be Determined

3.8.1 Responsibilities of EnSafe/Allen & Hoshall Field Project Manager

The Field Project Manager will direct the site investigation and operation. The Field Project Manager has the primary responsibility for assuring that all personnel are aware of:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on the site
- Use of personal protection equipment and assuring that the equipment is available
- Work practices by which the employee can minimize risks from hazards
- Safe use of engineering controls and equipment on the site
- Medical surveillance requirements including recognition of symptoms which might indicate over exposure to hazards

- Site control measures, decontamination procedures, site standard operating procedures and the contingency plan and responses to emergencies including the necessary PPE.

The Field Project Manager is also responsible for assuring that all employees have received at least 40 hours of health and safety instruction (off the site), and actual field experience under the direct supervision of a trained experienced supervisor. Workers who may be exposed to unique or special hazards shall be provided additional training.

The Field Project Manager also monitors the performance of personnel to ensure that mandatory health and safety procedures are being performed and corrects any performances that do not comply with the Health and Safety Plan. (Copies of health and safety training certificates must be available for review by the EnSafe/Allen & Hoshall Field Project Manager and Site Safety Officer.)

If unforeseen site conditions or an emergency occurs, the Field Project Manager shall ensure that the medical surveillance program is implemented as required by 29 CFR 1910.120. Additional responsibilities may include:

- Consulting with the Health and Safety Officer and/or other personnel
- Preparation and submittal of any and all project reports — includes progress, accident, incident, contractual, etc.
- Monitoring personnel decontamination to ensure that all personnel are complying with the established decontamination procedures.

3.8.2 Responsibilities of EnSafe/Allen & Hoshall Site Health and Safety Officer

The EnSafe/Allen & Hoshall Site Health and Safety Officer has the primary responsibility for:

- Assuring that a copy of the Health and Safety Plan is maintained onsite during all field activities.
- Advising the Field Project Manager on all health and safety related matters involved at the site.
- Directing and ensuring that the safety program is being correctly followed in the field, including the proper use of personal protective and site monitoring equipment.
- Ensuring that the field personnel observe the appropriate work zones and decontamination procedures.
- Reporting any safety violations to the Field Project Manager.
- Conducting safety briefings during field activities.

The Site Health and Safety Officer will be a person trained in safety and industrial hygiene. After the project begins and the Site Health and Safety Officer has had time to evaluate actual hazardous site conditions, he/she may determine that a member of the project team may assume the duties of the Site Health and Safety Officer.

The person responsible for daily health and safety will be trained to use the air monitoring equipment, interpret the data collected with the instruments, and be familiar with symptoms of heat stress and cold exposure and the location and use of safety equipment onsite. This person will also be familiar with this health and safety plan.

The following criteria outline when the Site Health and Safety Officer will be replaced: (1) termination of employment, (2) sickness, (3) end of shift, (4) injury, or (5) death. Because only one shift will be working, the Site Health and Safety Officer will be responsible for the day

shift. If circumstances arise that require work during other periods, an alternate Site Health and Safety Officer will be designated.

3.8.3 Responsibilities of Onsite Field Personnel

All onsite field personnel will be responsible for the following:

- All personnel going onsite must be thoroughly briefed on anticipated hazards and trained on equipment to be worn, safety procedures to be followed, emergency procedures and communications.
- Required respiratory protective devices and clothing must be worn by all personnel going into areas designated for wearing protective equipment.
- Personnel must be fit-tested before using respirators.
- No facial hair which intrudes on the sealing surface of the respirator is allowed on personnel.
- Personnel onsite must use the buddy system when wearing respiratory protective equipment. As a minimum, a third person, suitably equipped as a safety backup, is required during initial entries.
- Visual contact must be maintained between pairs onsite and site safety personnel. Field personnel should remain close together to assist each other during emergencies.
- All field personnel should make use of their senses to alert themselves to potentially dangerous situations which they should avoid, e.g., presence of strong and irritating or nauseating odors.
- Personnel should practice unfamiliar operations prior to doing the actual procedure in the field.
- Field personnel shall be familiar with the physical characteristics of the site, including:
  - — wind direction in relation to contamination zones
  - — accessibility to associates, equipment and vehicles
  - — communications

- — operation zones
- — site access
- — nearest water sources

- The number of personnel and equipment in the contaminated area must be kept to a minimum, consistent with effective site operations.
- Procedures for leaving a contaminated area must be planned and implemented before going onsite in accordance with the Site Health and Safety Plan.
- All visitors to the job site must comply with the Health and Safety Plan procedures. Personal protection equipment may be modified for visitors depending on the situation. Modifications must be approved by the Site Health and Safety Officer.

3.9 Emergency Information

All hazardous waste site activities present a potential risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert and using proper personal protective equipment. Unpredictable events such as physical injury, chemical exposure or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside or support service, Tonya Barker, the NAS Memphis site contact, will be informed. The appropriate contact from the following list will also be made:

Contact	Agency or Organization	Telephone
Tonya Barker	NAS Memphis	(901) 873-5209
John Karlyk	SOUTHDIV EIC	(803) 743-0607
Law Enforcement	NAS Memphis Security	911
Fire Department	NAS Memphis Security	911

Hospital Emergency	Naval Hospital	(901) 873-5801/5802
	Methodist North Hospital	(901) 372-5211
—	Southern Poison Control Center	(901) 528-6048
—	CHEMTREC	(800) 424-9300
Lawson Anderson	EnSafe/Allen & Hoshall	(901) 383-9115

John Karlyk, the SOUTHDIV Engineer-in-Charge, will be contacted after appropriate emergency measures have been initiated onsite.

Site Resources

Telephones for emergency use are located in the hospital building adjacent to the work area. First aid equipment, restroom facilities and water supply will be available near the work zone.

3.10 Emergency Procedures

Emergency procedures are to be followed if any of the following situations develop onsite:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site; or
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

Further emergency response procedures are provided in Appendix F.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the Site Safety Officer.

- If any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the Site Safety Officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the Site Safety Officer to indicate possible routes for upwind escape.
- The discovery of any conditions that would suggest the existence of a situation more hazardous than anticipated will result in the suspension of work until the Safety Officer has evaluated the situation and provided the appropriate instructions to the field team.
- If an accident occurs, the Field Project Manager is to complete an accident report form for submittal to the managing principal-in-charge of the project.
- If a member of the field crew suffers a personal injury, the Site Health and Safety Officer will call 911 (serious injury) to alert appropriate emergency response agencies or administer onsite first aid (minor injury) as the situation dictates. An Accident Report Form will be completed for any such incident.
- If a member of the field crew suffers a chemical exposure, the affected areas should be flushed immediately with copious amounts of clean water. If the situation dictates, the Site Health and Safety Officer should alert appropriate emergency response agencies, or personally ensure that the exposed individual is transported to the nearest medical treatment facility for prompt treatment. An Accident Report Form will be completed for any such incident.

Additional information on appropriate chemical exposure treatment methods is provided in Appendix E. Directions to the nearest emergency medical facility capable of providing general emergency medical assistance and treating chemical burns are provided in Appendix G. The Naval Hospital will accept non-military patients in life-threatening situations only. Methodist North Hospital is the closest medical facility for injuries or illnesses which are not life-

threatening. Figure 3-4 is a map which provides directions from the site to Methodist North Hospital.

3.11 Forms

The following forms will be used in implementing this Health and Safety Plan:

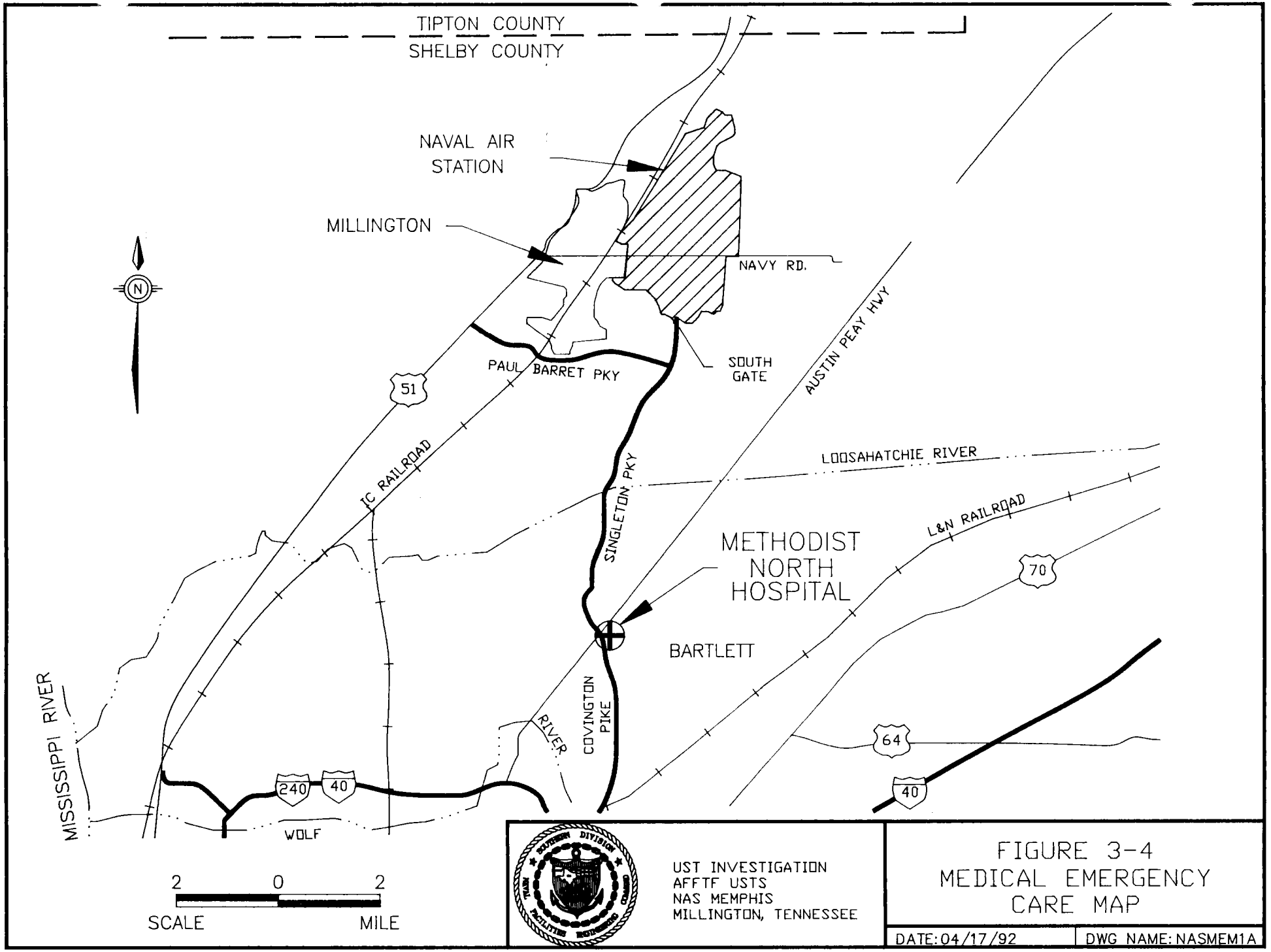
Plan Acceptance Form

Plan Feedback Form

Exposure History Form

The Plan Acceptance Form will be filled out by all employees working on the site before site activities begin. The Plan Feedback Form will be filled out by the Site Safety Officer and any other onsite employee who wishes to fill one out. The Exposure History Form will be completed by both the Field Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in Appendix H.

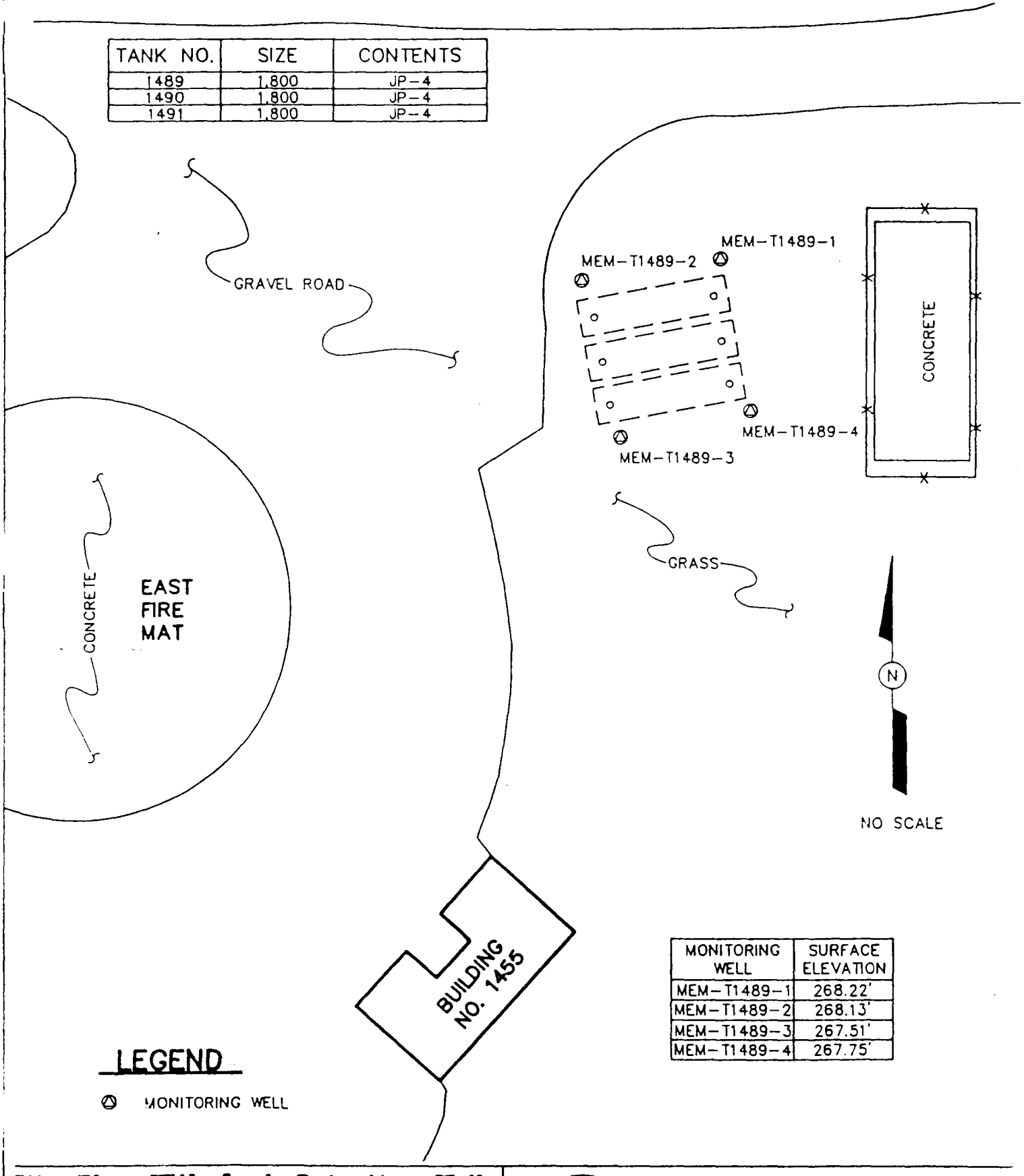
All completed forms must be returned to the Task Order Manager at EnSafe/Allen & Hoshall, Memphis, Tennessee.


TIPTON COUNTY
SHELBY COUNTY
NAVAL AIR STATION
MILLINGTON
NAVY RD.
SOUTH GATE
PAUL BARRET PKY
51
IC RAILROAD
AUSTIN PEAY HWY
LOOSAHATCHIE RIVER
SINGLETON PKY
L&N RAILROAD
METHODIST NORTH HOSPITAL
70
BARTLETT
COVINGTON PIKE
RIVER
64
40
240
40
WOLF
MISSISSIPPI RIVER
N
2 0 2
SCALE MILE
UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE
FIGURE 3-4
MEDICAL EMERGENCY
CARE MAP
DATE: 04/17/92
DWG NAME: NASMEM1A

APPENDIX A

EXISTING WELL INFORMATION

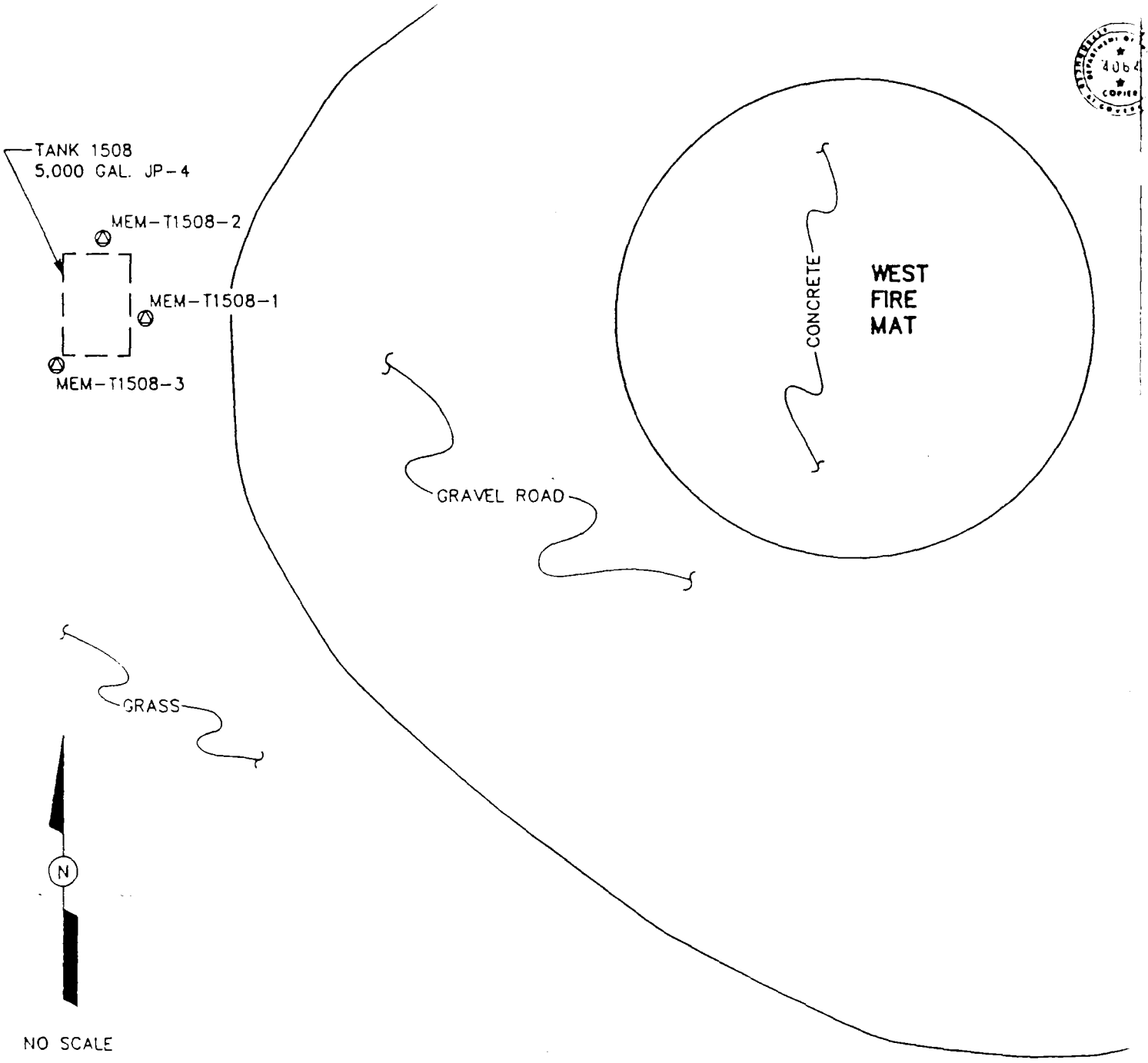
TANK NO.	SIZE	CONTENTS
1489	1,800	JP-4
1490	1,800	JP-4
1491	1,800	JP-4



MONITORING WELL	SURFACE ELEVATION
MEM-T1489-1	268.22'
MEM-T1489-2	268.13'
MEM-T1489-3	267.51'
MEM-T1489-4	267.75'

Site Plan With Leak Detection Wells For Tanks 1489,1490 And 1491
Figure 5-7

Release Detection Manual
Naval Air Station



MONITORING WELL	SURFACE ELEVATION
MEM-T1508-1	268.07'
MEM-T1508-2	267.74'
MEM-T1508-3	266.67'

LEGEND

⊘ MONITORING WELL

Site Plan With Leak Detection Wells For Tanks 1508

Figure 5-8

Page 5-12

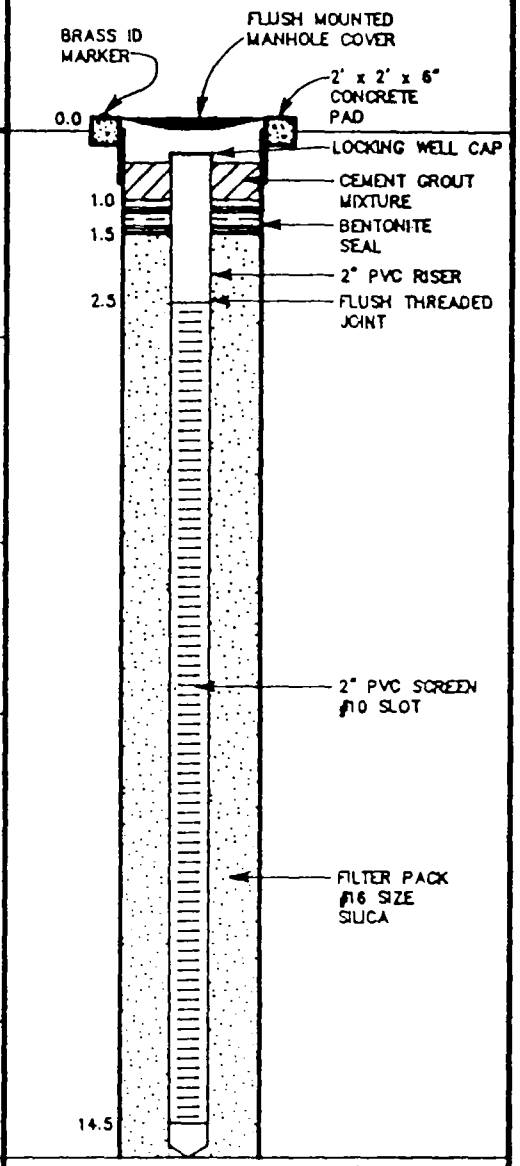
Release Detection Manual
Naval Air Station
Memphis, Tennessee

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

LOCATION TANK SYSTEMS 1489, 1490, 1491, NAS, MEMPHIS, TN.

LOG OF BORING NO. A1 LOG OF WELL NO. MEM-T1489-1

DEPTH IN FEET	SYMBOL	SAMPLES (LAB)	MATERIAL DESCRIPTION
			SILT, LIGHT BROWN, WITH PEA GRAVEL MOIST
			3.0
			SILT, CLAYEY, LIGHT BROWN
5			6.0
			SILT, CLAYEY, GREEN, WET
			8.5
10			SILT, CLAYEY, LIGHT BROWN, WET MODERATE HYDROCARBON ODOR
			13.0
			13.1 24 HOUR WATER LEVEL
			SILT, CLAYEY, GRAY, WET MODERATE HYDROCARBON ODOR
15			15.0
			TERMINATED @ 15.0



Boring Completion Date: DEC. 28, 1989 — Boring Diameter: 6.75"

Well Completion Date: DEC. 28, 1989 — Ground Elevation: 268.13'

Well Development Date: N.A. — Top of Casing Elevation:

Drilling Method: POWER AUGER — Driller: B. ELDER

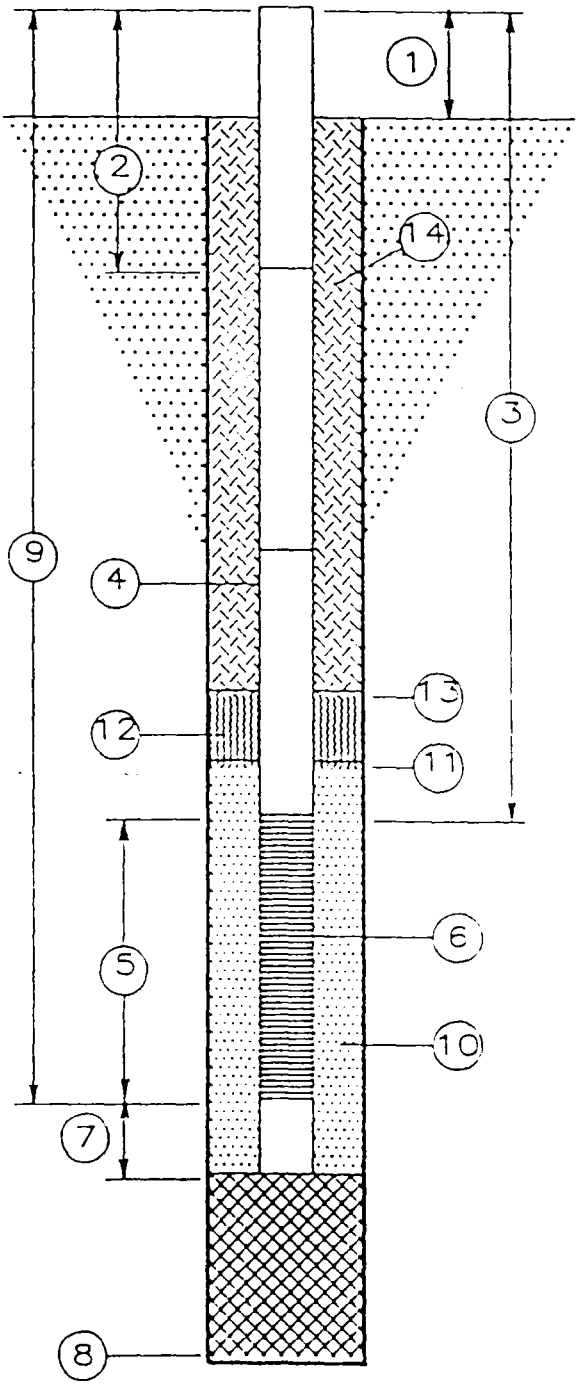
Depth to Water: 13.1' — Logged by: L. RICHARDS

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P.O. BOX 10068
CHARLESTON, S.C. 29411-0068

WELL CONSTRUCTION DETAILS

WELL NUMBER MEM-T1489-1

DATE OF INSTALLATION 12-28-89



1. Height of Casing above ground 2 inches
2. Depth to first Coupling 2.5 ft.
   Coupling Interval Depths 2.5 ft., 5.0 ft.
   15.0 ft.
3. Total Length of Blank Pipe 2.5 ft.
4. Type of Blank Pipe Schedule 40 PVC
5. Length of Screen 12.5 ft.
6. Type of Screen Schedule 40 PVC (0.01" slot)
7. Length of Sump 0
8. Total Depth of Boring 15 ft. Hole Diameter 8 in
9. Depth To Bottom of Screen 15.0 ft.
10. Type of Screen Filter Quartz sand
    Quantity Used 14.66 ft.^{3} Size #16 U/C ____
11. Depth To Top of Filter 1 ft.
12. Type of Seal Bentonite pellets
    Quantity Used 1.05 ft.^{3}
13. Depth To Top of Seal 0 ft.
14. Type of Grout Cement
    Grout Mixture 100%
    Method of Placement Pour

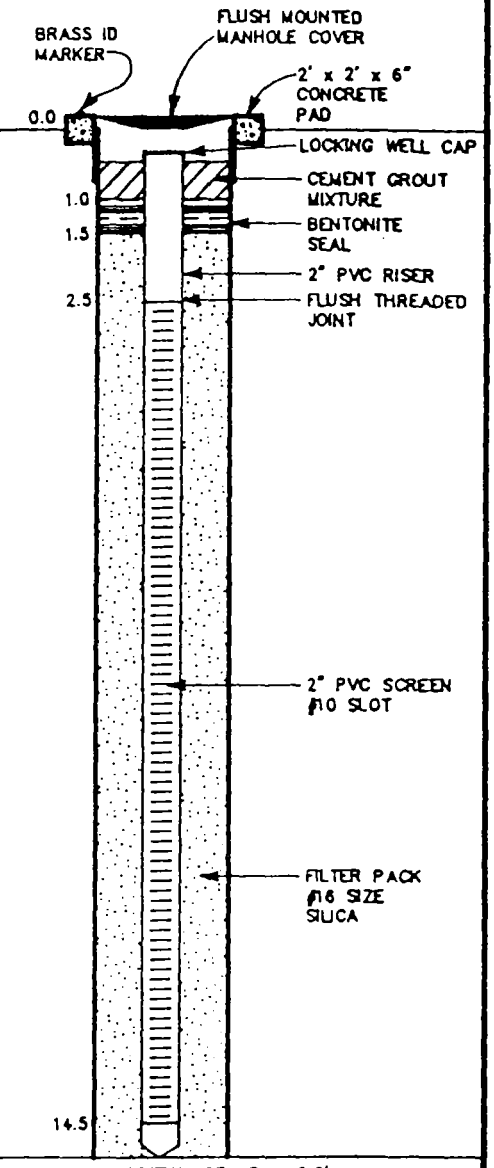
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

LOCATION TANK SYSTEMS 1489, 1490, 1491, NAS, MEMPHIS, TN.

LOG OF BORING NO. A2 LOG OF WELL NO. MEM-T1489-2

DEPTH IN FEET	SYMBOL	SAMPLES (LAB)	MATERIAL DESCRIPTION
			SILTY, BROWN, MOIST
			3.0
5			SILT, CLAYEY, GRAY SLIGHT HYDROCARBON ODOR
			6.0
			SILT, CLAYEY, GREEN, WET MODERATE HYDROCARBON ODOR
10			10.0
			SILT, CLAYEY, LIGHT BROWN, WET MODERATE HYDROCARBON ODOR
			12.2 24 HOUR WATER LEVEL
			13.0
			SILT, CLAYEY, GRAY, WET MODERATE HYDROCARBON ODOR
15			15.0 TERMINATED @ 15.0

WELL CONSTRUCTION



Boring Completion Date: DEC. 28, 1989 — Boring Diameter: 6.75"

Well Completion Date: DEC. 28, 1989 — Ground Elevation: 268.22'

Well Development Date: N.A. — Top of Casing Elevation:

Drilling Method: POWER AUGER — Driller: B. ELDER

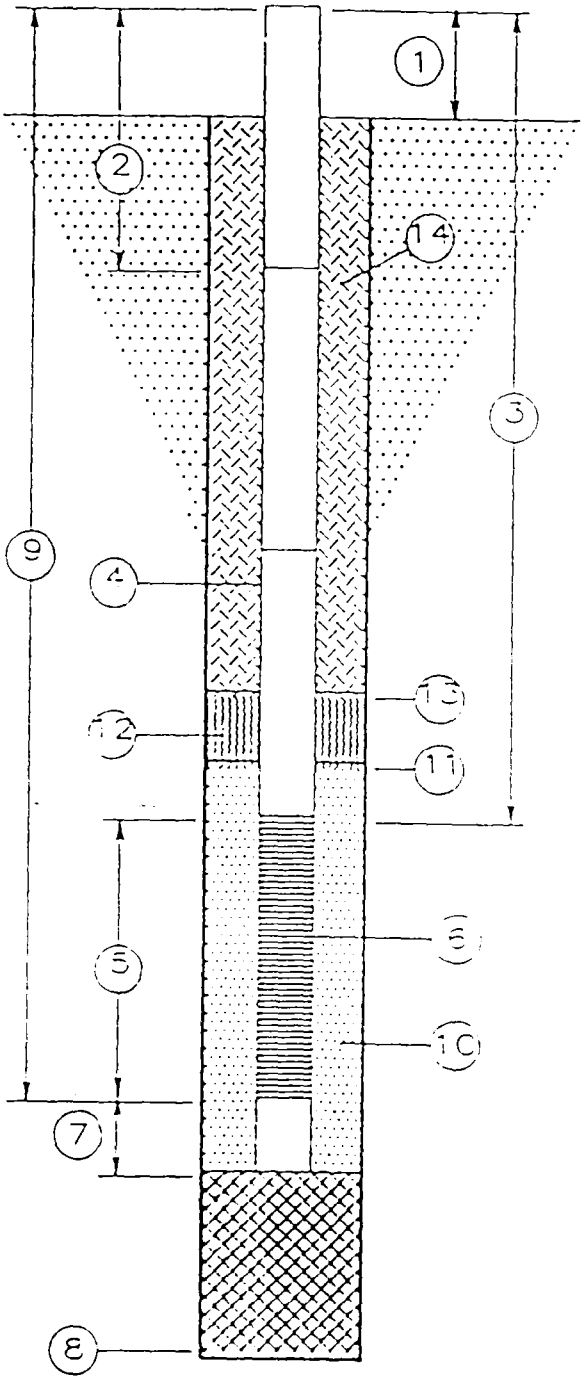
Depth to Water: 12.2' — Logged by: L. RICHARDS

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P.O. BOX 10068
CHARLESTON, S.C. 29411-0068

WELL CONSTRUCTION DETAILS

WELL NUMBER MEM-1489-2

DATE OF INSTALLATION 12/28/89



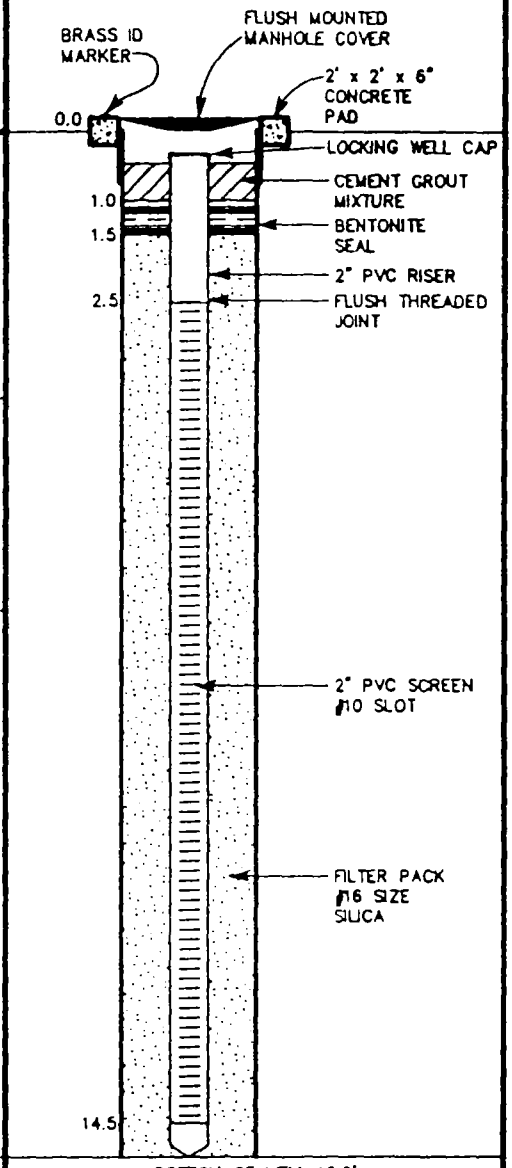
1. Height of Casing above ground 2 inches
2. Depth to first Coupling 2.5 ft.
   Coupling Interval Depths 2.5 ft., 5.0 ft.
   15.0 ft.
3. Total Length of Blank Pipe 2.5 ft.
4. Type of Blank Pipe Schedule 40 PVC
5. Length of Screen 12.5 ft.
6. Type of Screen Schedule 40 PVC (0.01" slot)
7. Length of Sump 0
8. Total Depth of Boring 15 ft. Hole Diameter 8 ins
9. Depth To Bottom of Screen 15.0 ft.
10. Type of Screen Filter Quartz sand
    Quantity Used 14.66 ft.^{3} Size #16 x #30
11. Depth To Top of Filter 1 ft.
12. Type of Seal Bentonite pellets
    Quantity Used 1.05 ft.^{3}
13. Depth To Top of Seal 0 ft.
14. Type of Grout Cement
    Grout Mixture 100%
    Method of Placement Pour

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

LOCATION TANK SYSTEMS 1489, 1490, 1491, NAS, MEMPHIS, TN.

LOG OF BORING NO. A3 LOG OF WELL NO. MEM-T1489-3

DEPTH IN FEET	SYMBOL	SAMPLES (LAB)	MATERIAL DESCRIPTION
			SILT, UGHT BROWN
			4.0
5			CLAY, SILTY, GRAY
			7.0
10			CLAY, SILTY, GRAY, MOIST SLIGHT HYDROCARBON ODOR
			13.8 24 HOUR WATER LEVEL
15			15.0 TERMINATED @ 15.0



Boring Completion Date: DEC. 28, 1989 — Boring Diameter: 6.75"

Well Completion Date: DEC. 28, 1989 — Ground Elevation: 267.51'

Well Development Date: N.A. — Top of Casing Elevation:

Drilling Method: POWER AUGER — Driller: B. ELDER

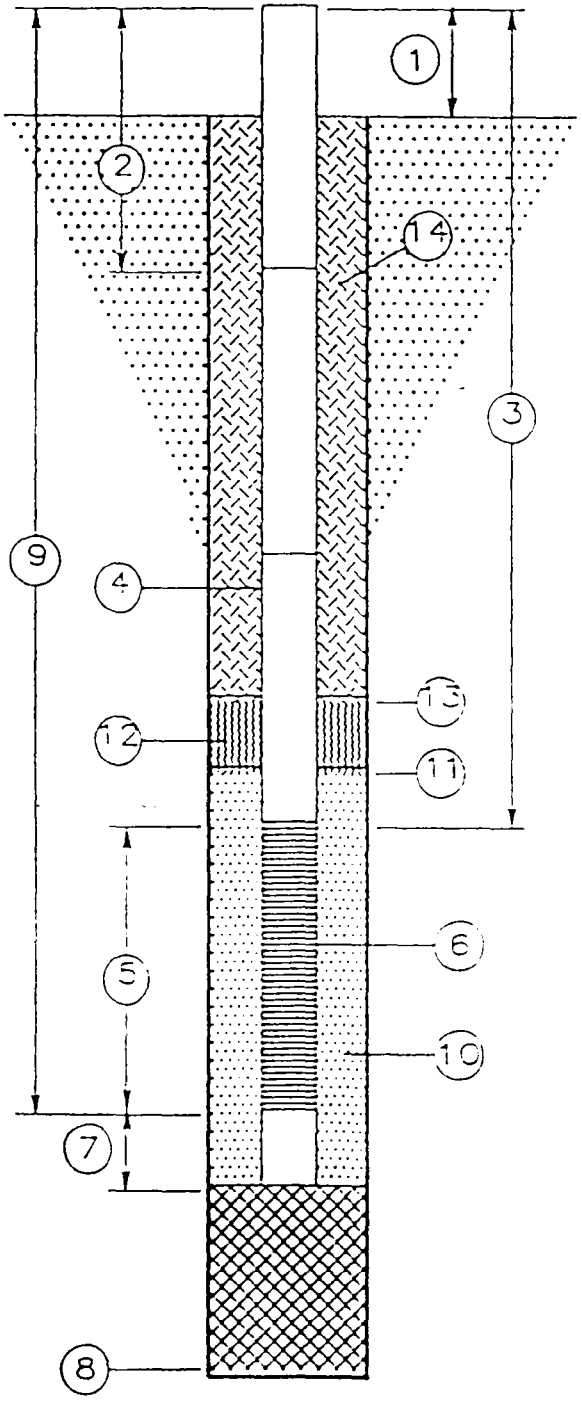
Depth to Water: 13.8' — Logged by: L. RICHARDS

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P.O. BOX 10068
CHARLESTON, S.C. 29411-0068

WELL CONSTRUCTION DETAILS

WELL NUMBER MEM-T-1489-3

DATE OF INSTALLATION 12-28-89



1. Height of Casing above ground 2 inches
2. Depth to first Coupling 2.5 ft.
   Coupling Interval Depths 2.5 ft., 5.0 ft.
   15.0 ft.
3. Total Length of Blank Pipe 2.5 ft.
4. Type of Blank Pipe Schedule 40 PVC
5. Length of Screen 12.5 ft.
6. Type of Screen Schedule 40 PVC (0.01" slot)
7. Length of Sump 0
8. Total Depth of Boring 15 ft. Hole Diameter 8 inc
9. Depth To Bottom of Screen 15.0 ft.
10. Type of Screen Filter Quartz sand
    Quantity Used 14.66 ft.^{3} Size #16 U/C
11. Depth To Top of Filter 1 ft.
12. Type of Seal Bentonite pellets
    Quantity Used 1.05 ft.^{3}
13. Depth To Top of Seal 0 ft.
14. Type of Grout Cement
    Grout Mixture 100%
    Method of Placement Pour

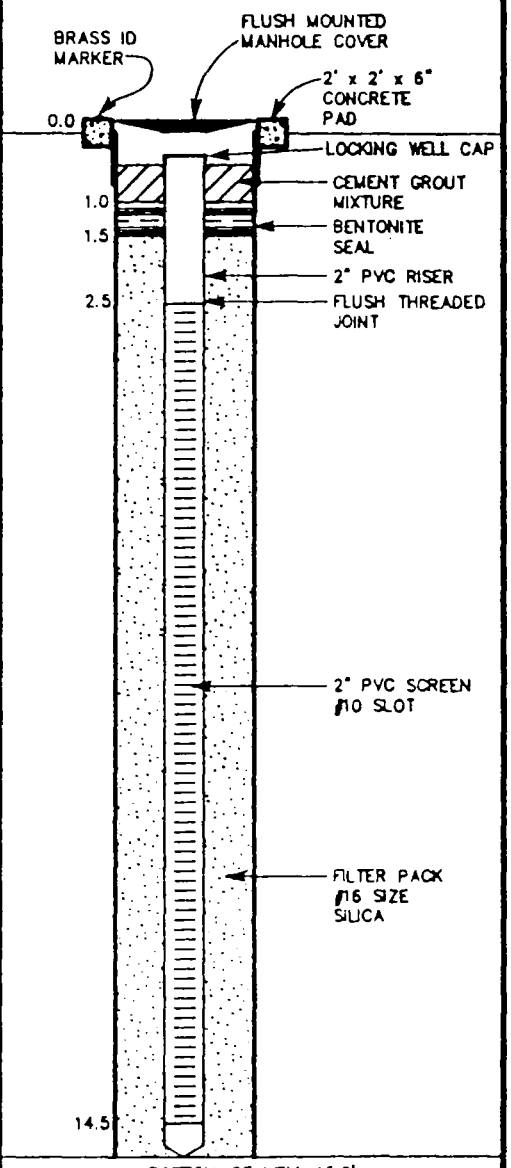
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

LOCATION TANK SYSTEMS 1489, 1490, 1491, NAS, MEMPHIS, TN.

LOG OF BORING NO. A4 LOG OF WELL NO. MEM-T1489-4

DEPTH IN FEET	SYMBOL	SAMPLES (LAB)	MATERIAL DESCRIPTION
			SILT, LIGHT BROWN, MOIST
			2.0
			SILT, CLAYEY, GRAY SLIGHT HYDROCARBON ODOR
			4.0
5			SILT, CLAYEY, GREEN, MOIST SLIGHT HYDROCARBON ODOR
			7.0
10			SILT, CLAYEY, LIGHT BROWN, MOIST MODERATE HYDROCCARBON ODOR
			12.0
			13.1 — 24 HOUR WATER LEVEL
			SILT, CLAYEY, GRAY
15			15.0
			TERMINATED @ 15.0

WELL CONSTRUCTION



Boring Completion Date: NOV. 18, 1990 — Boring Diameter: 6.75"

Well Completion Date: NOV. 28, 1990 — Ground Elevation: 267.75'

Well Development Date: N.A. — Top of Casing Elevation:

Drilling Method: POWER AUGER — Driller: B. ELDER

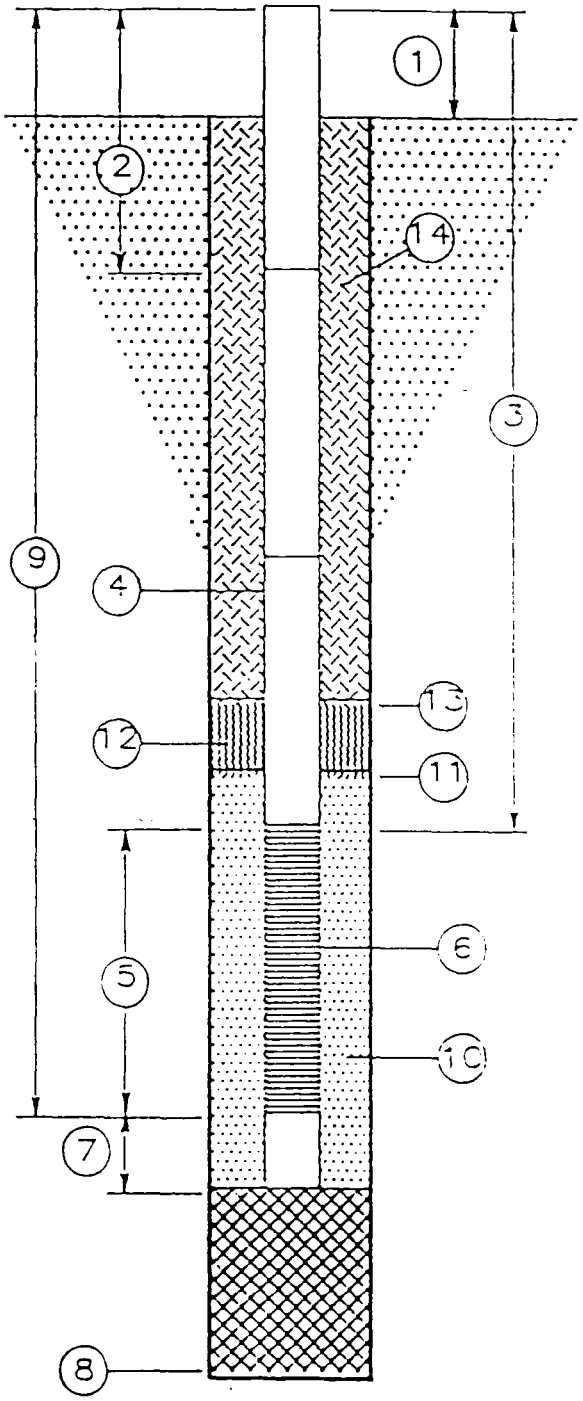
Depth to Water: 13.1' — Logged by: L. RICHARDS

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P.O. BOX 10068
CHARLESTON, S.C. 29411-0068

WELL CONSTRUCTION DETAILS

WELL NUMBER MEM-T1489-4

DATE OF INSTALLATION 12-28-89



1. Height of Casing above ground 2 inches
2. Depth to first Coupling 2.5 ft.
   Coupling Interval Depths 2.5 ft., 5.0 ft. 15.0 ft.
3. Total Length of Blank Pipe 2.5 ft.
4. Type of Blank Pipe Schedule 40 PVC
5. Length of Screen 12.5 ft.
6. Type of Screen Schedule 40 PVC (0.01" slot)
7. Length of Sump 0
8. Total Depth of Boring 15 ft. Hole Diameter 3 inc
9. Depth To Bottom of Screen 15.0 ft.
10. Type of Screen Filter Quartz sand
    Quantity Used 14.66 ft.^{3} Size #16 U/C
11. Depth To Top of Filter 1 ft.
12. Type of Seal Bentonite pellets
    Quantity Used 1.05 ft.^{3}
13. Depth To Top of Seal 0 ft.
14. Type of Grout Cement
    Grout Mixture 100%
    Method of Placement Pour

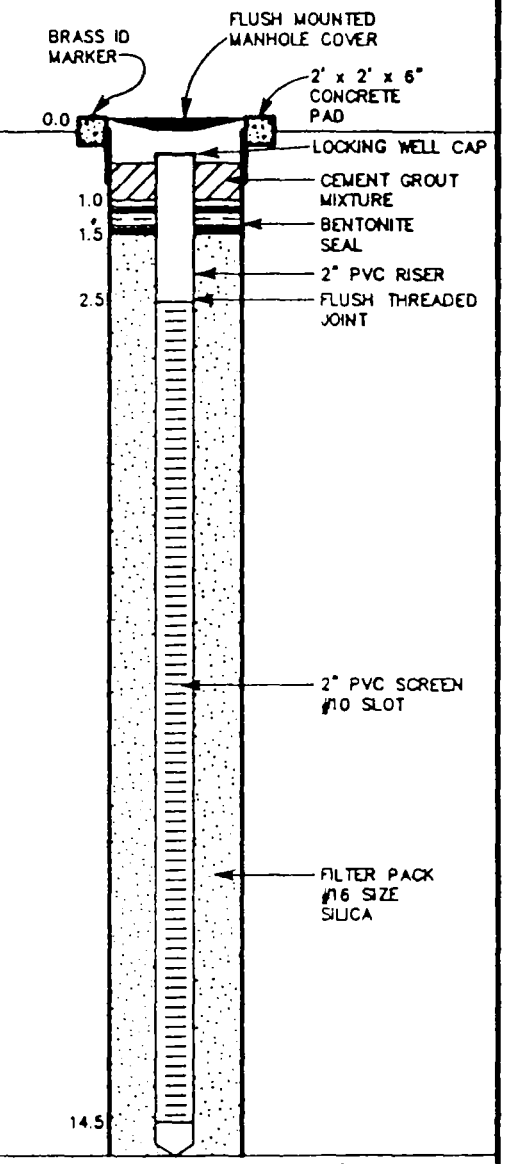
SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

LOCATION TANK SYSTEM 1508, NAS, MEMPHIS, TN.

LOG OF BORING NO. A1 LOG OF WELL NO. MEM-T1508-1

DEPTH IN FEET	SYMBOL	SAMPLES (LAB)	MATERIAL DESCRIPTION
			GRAVEL
			1.0
			SILT, LIGHT BROWN, MOIST SLIGHT HYDROCARBON ODOR
			4.0
5			SILT, CLAYEY, GREEN, MOIST SLIGHT HYDROCARBON ODOR
			6.0
			SILT, CLAYEY, GRAY MODERATE HYDROCARBON ODOR
10			10.0
			SILTY, CLAYEY, LIGHT BROWN SLIGHT HYDROCARBON ODOR
			13.0 — 24 HOUR WATER LEVEL
15			15.0
			TERMINATED @ 15.0

WELL CONSTRUCTION



Boring Completion Date: DEC. 29, 1990 — Boring Diameter: 6.75"

Well Completion Date: DEC. 29, 1990 — Ground Elevation: 268.07'

Well Development Date: N.A. — Top of Casing Elevation:

Drilling Method: POWER AUGER — Driller: B. ELDER

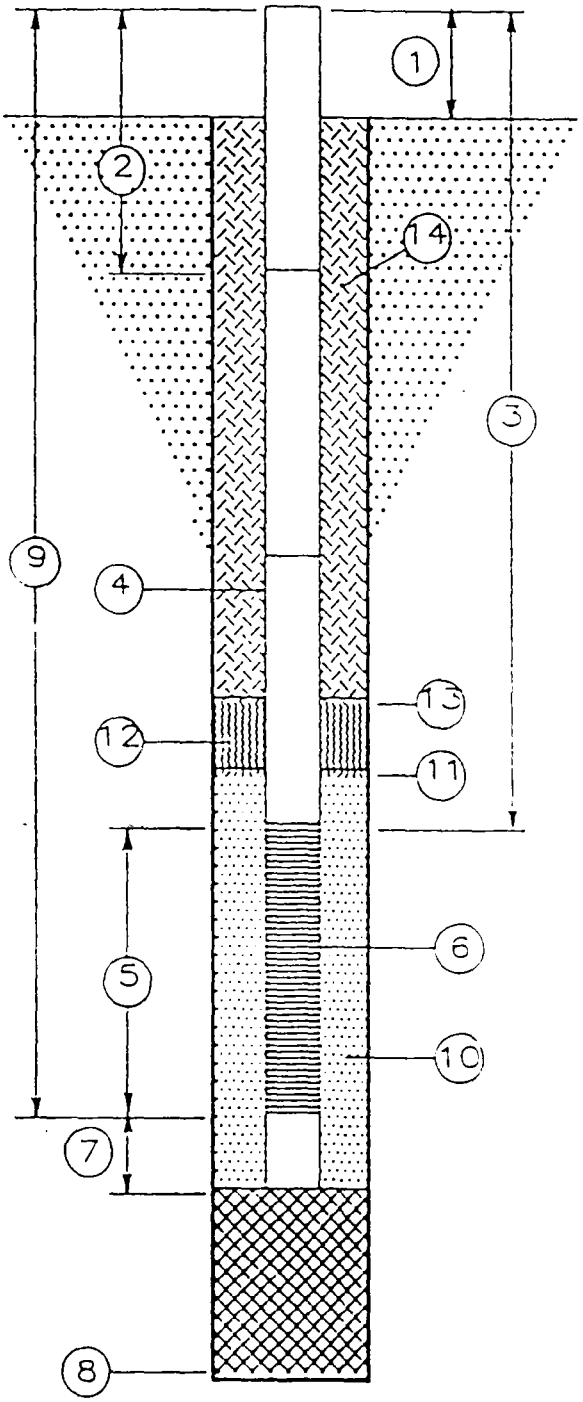
Depth to Water: 13.0' — Logged by: L. RICHARDS

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P.O. BOX 10068
CHARLESTON, S.C. 29411-0068

WELL CONSTRUCTION DETAILS

WELL NUMBER MEM-T1508-1

DATE OF INSTALLATION 12-29-89



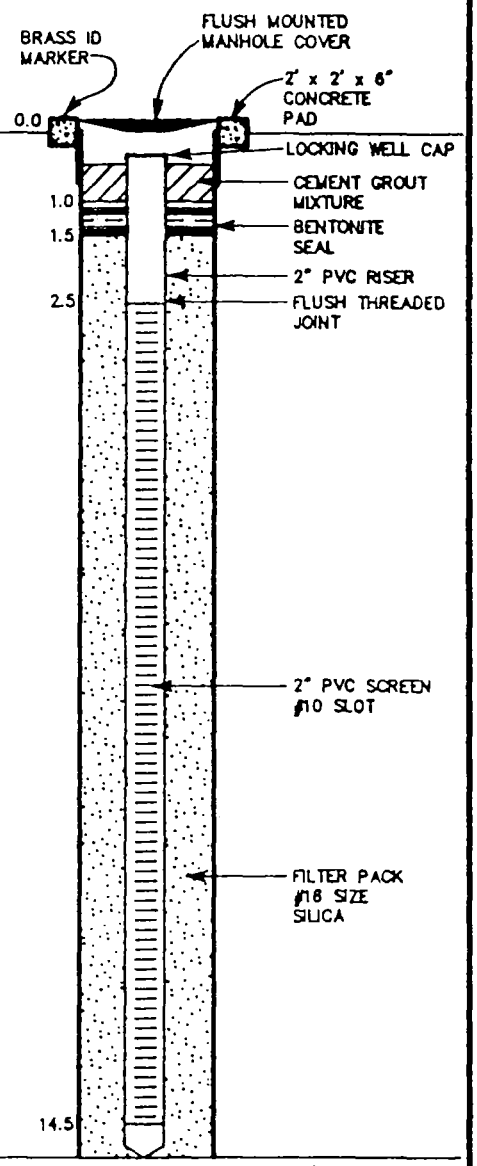
1. Height of Casing above ground 2 inches
2. Depth to first Coupling 2.5 ft.
   Coupling Interval Depths 2.5 ft., 5.0 ft.
   15.0 ft.
3. Total Length of Blank Pipe 2.5 ft.
4. Type of Blank Pipe Schedule 40 PVC
5. Length of Screen 12.5 ft.
6. Type of Screen Schedule 40 PVC (0.01" slot)
7. Length of Sump 0
8. Total Depth of Boring 15 ft. Hole Diameter 8 inc
9. Depth To Bottom of Screen 15.0 ft.
10. Type of Screen Filter Quartz sand
    Quantity Used 14.66 ft.^{3} Size #16 U/C
11. Depth To Top of Filter 1 ft.
12. Type of Seal Bentonite pellets
    Quantity Used 1.05 ft.^{3}
13. Depth To Top of Seal 0 ft.
14. Type of Grout Cement
    Grout Mixture 100%
    Method of Placement Pour

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

LOCATION TANK SYSTEM 1508, NAS, MEMPHIS, TN.

LOG OF BORING NO. A2 LOG OF WELL NO. MEM-T1508-2

DEPTH IN FEET	SYMBOL	SAMPLES (LAB)	MATERIAL DESCRIPTION
			SILT, LIGHT BROWN, WITH GRAVEL MOIST, SLIGHT HYDROCARBON ODOR
4.0			
5			SILT, CLAYEY, LIGHT GRAY SLIGHT HYDROCARBON ODOR
9.0			
10			SILT, CLAYEY, LIGHT BROWN, WET SLIGHT HYDROCARBON ODOR
12.9			24 HOUR WATER LEVEL
15			
15.0			TERMINATED @ 15.0



WELL CONSTRUCTION

Boring Completion Date: DEC. 29, 1990
Well Completion Date: DEC. 29, 1990
Well Development Date: N.A.
Drilling Method: POWER AUGER
Depth to Water: 12.9'

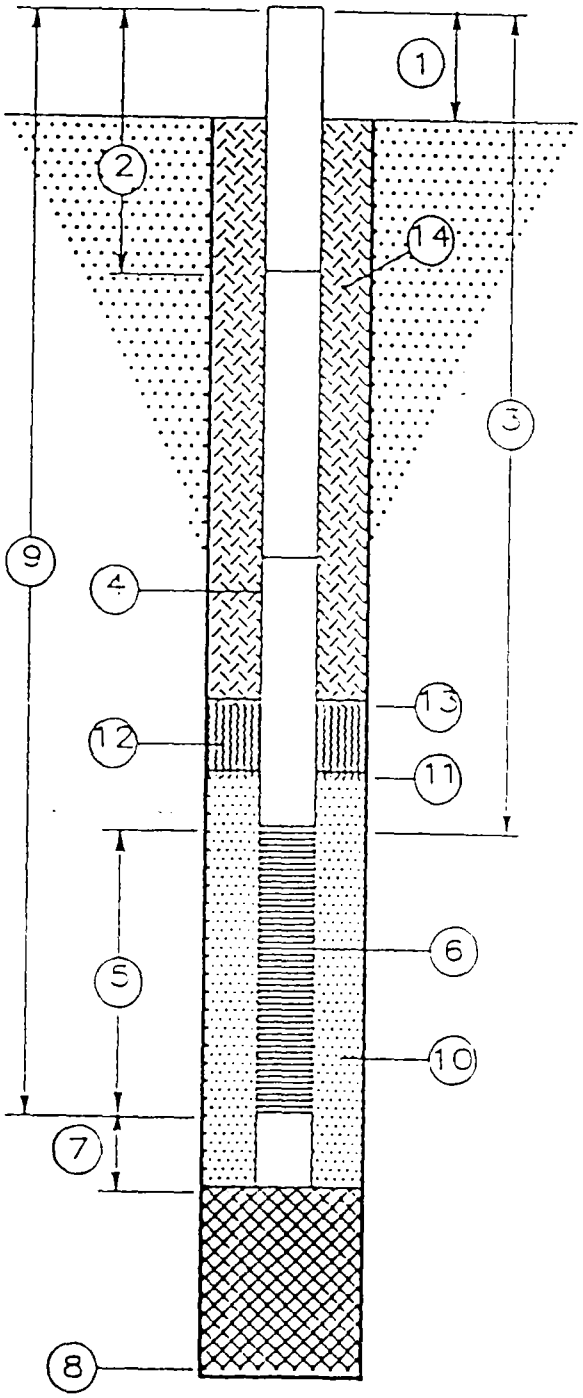
Boring Diameter: 6.75"
Ground Elevation: 267.74'
Top of Casing Elevation:
Driller: B. ELDER
Logged by: L. RICHARDS

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P.O. BOX 10068
CHARLESTON, S.C. 29411-0068

WELL CONSTRUCTION DETAILS

WELL NUMBER MEM-T1508-2

DATE OF INSTALLATION 12/29/89



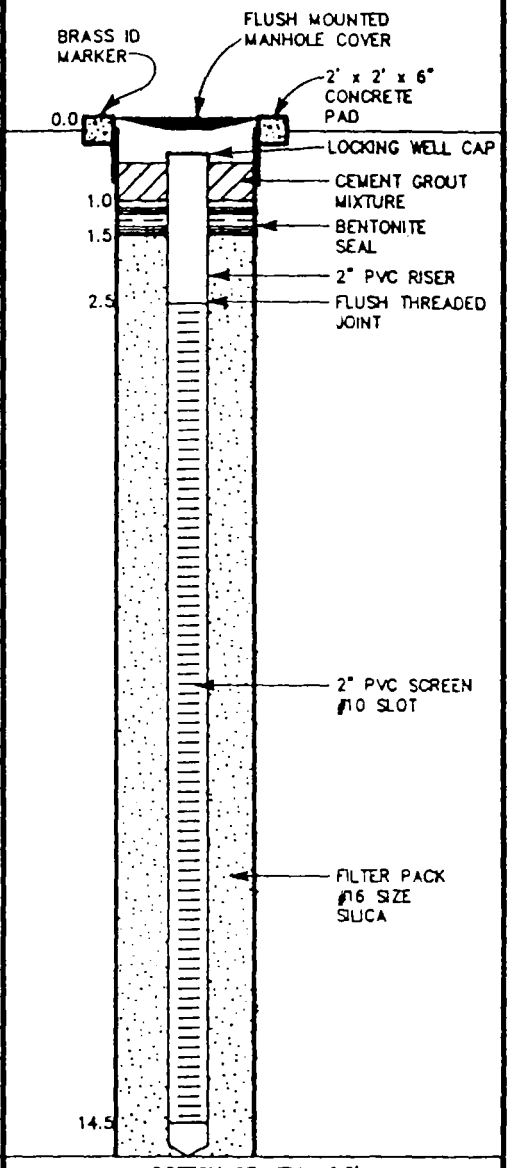
1. Height of Casing above ground 2 inches
2. Depth to first Coupling 2.5 ft.
   Coupling Interval Depths 2.5 ft., 5.0 ft.
   15.0 ft.
3. Total Length of Blank Pipe 2.5 ft.
4. Type of Blank Pipe Schedule 40 PVC
5. Length of Screen 12.5 ft.
6. Type of Screen Schedule 40 PVC (0.01" slot)
7. Length of Sump 0
8. Total Depth of Boring 15 ft. Hole Diameter 8 inch
9. Depth To Bottom of Screen 15.0 ft.
10. Type of Screen Filter Quartz sand
    Quantity Used 14.66 ft.^{3} Size #16 U/C
11. Depth To Top of Filter 1 ft.
12. Type of Seal Bentonite pellets
    Quantity Used 1.05 ft.^{3}
13. Depth To Top of Seal 0 ft.
14. Type of Grout Cement
    Grout Mixture 100%
    Method of Placement Pour

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

LOCATION TANK SYSTEM 1508, NAS, MEMPHIS, TN.

LOG OF BORING NO. A3 LOG OF WELL NO. MEM-T1508-3

DEPTH IN FEET	SYMBOL	SAMPLES (LAB)	MATERIAL DESCRIPTION
			SILT, CLAYEY, LIGHT BROWN WITH GRAVEL MOIST, SLIGHT HYDROCARBON ODOR
4.0			
5			SILT, CLAYEY, LIGHT GRAY WITH TRACES OF GRAVEL, SLIGHT HYDROCARBON ODOR
9.0			
10			SILT, CLAYEY, LIGHT BROWN, MOIST SLIGHT HYDROCARBON ODOR
12.5			24 HOUR WATER LEVEL
15			
15.0			TERMINATED @ 15.0



WELL CONSTRUCTION

Boring Completion Date: DEC. 29, 1990 — Boring Diameter: 6.75"

Well Completion Date: DEC. 29, 1990 — Ground Elevation: 266.67'

Well Development Date: N.A. — Top of Casing Elevation:

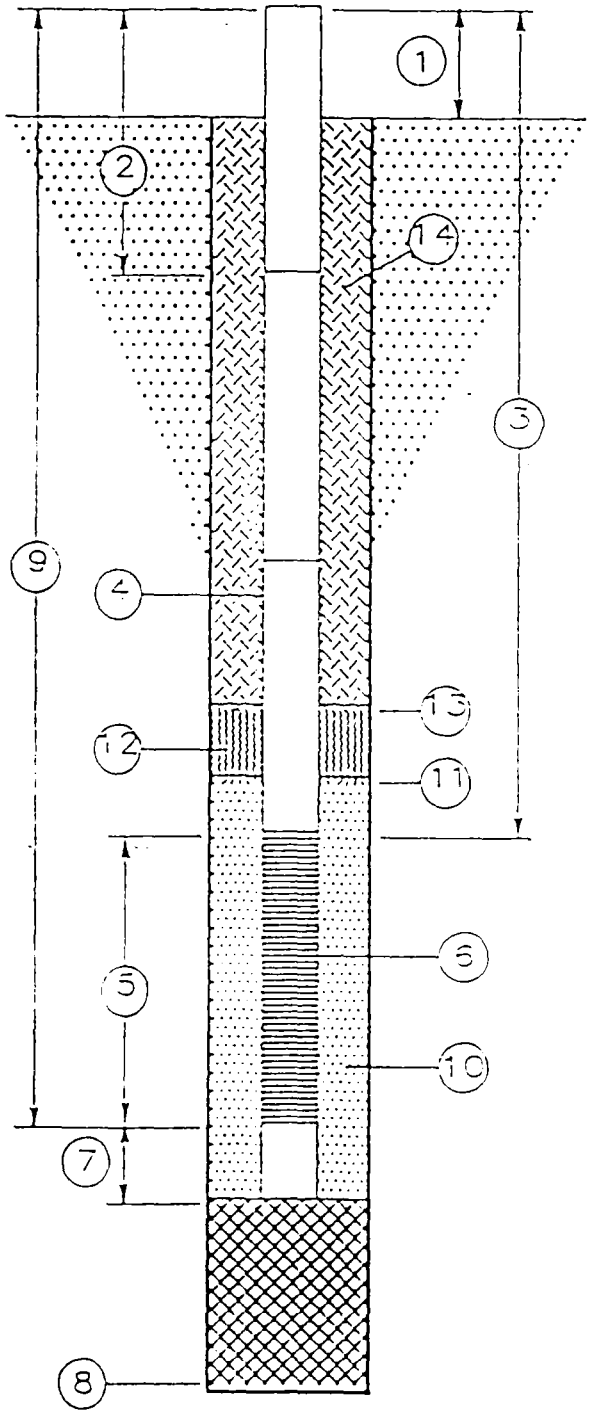
Drilling Method: POWER AUGER — Driller: B. ELDER

Depth to Water: 12.5' — Logged by: L. RICHARDS

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
2155 EAGLE DR., P.O. BOX 10068
CHARLESTON, S.C. 29411-0068

WELL NUMBER MEM-T1508-3

DATE OF INSTALLATION 12-29-89



1. Height of Casing above ground 2 inches
2. Depth to first Coupling 2.5 ft.
   Coupling Interval Depths 2.5 ft., 5.0 ft. 15.0 ft.
3. Total Length of Blank Pipe 2.5 ft.
4. Type of Blank Pipe Schedule 40 PVC
5. Length of Screen 12.5 ft.
6. Type of Screen Schedule 40 PVC (0.01" slot)
7. Length of Sump 0
8. Total Depth of Boring 15 ft. Hole Diameter 8 in
9. Depth To Bottom of Screen 15.0 ft.
10. Type of Screen Filter Quartz sand
    Quantity Used 14.66 ft.^{3} Size #1 U/C
11. Depth To Top of Filter 1 ft.
12. Type of Seal Bentonite pellets
    Quantity Used 1.05 ft.^{3}
13. Depth To Top of Seal 0 ft.
14. Type of Grout Cement
    Grout Mixture 100%
    Method of Placement Pour

Well Construction Details

Appendix III

Release Detection Manual
NAS Memphis, Tn
April, 1991

APPENDIX B

ANALYTICAL METHOD DETECTION LIMITS

ANALYTICAL METHOD DETECTION LIMITS

CONSTITUENT	LABORATORY DETECTION LIMIT*	
	SOIL (ug/kg)[A]	WATER (ug/L)[A]
EPA METHOD 418.1 PETROLEUM HYDROCARBONS:	10	0.1
CLP-VOLATILES:		
1) Chloromethane	10.	10.
2) Bromomethane	10.	10.
3) Vinyl chloride	10.	10.[I]
4) Chloroethane	10.	10.
5) Methylene chloride	5.	5.
6) Acetone	10.	10.
7) Carbon disulfide	5.	5.
8) 1,1-Dichloroethene	5.	5.
9) 1,1-Dichloroethane	5.	5.
10) 1,2-Dichloroethene (total)	5.	5.
11) Chloroform	5.	5.
12) 1,2-Dichloroethane	5.	5.
13) 2-Butanone	10.	10.
14) 1,1,1-Trichloroethane	5.	5.
15) Carbon tetrachloride	5.	5.

CONSTITUENT	LABORATORY DETECTION LIMIT*	
	SOIL (ug/kg)[A]	WATER (ug/L)[A]
CLP-VOLATILES (CONTINUED):		
16) Vinyl acetate	10.	10.
17) Bromodichloromethane	5.	5.
18) 1,2-Dichloropropane	5.	5.
19) Cis-1,3-Dichloropropene	5.	5.
20) Trichloroethene	5.	5.
21) Dibromochloromethane	5.	5.
22) 1,1,2-Trichloroethane	5.	5.
23) Benzene	5.	5.
24) Trans-1,3-Dichloropropene	5.	5.
25) Bromoform	5.	5.
26) 4-Methl-2-pentanone	10.	10.
27) 2-Hexanone	10.	10.
28) Tetrachloroethene	5.	5.
29) 1,1,2,2-Tetrachloroethane	5.	5.
30) Toluene	5.	5.
31) Chlorobenzene	5.	5.
32) Ethylbenzene	5.	5.
33) Styrene	5.	5.
34) Xylenes (total)	5.	5.

CONSTITUENT	LABORATORY DETECTION LIMIT[A]	
	SOIL (ug/kg)[C]	WATER (ug/L)[B]
CLP-SEMI-VOLATILES:		
1) Phenol	330.	10.
2) bis(2-Chloroethyl)ether	330.	10.
3) 2-Chlorophenol	330.	10.
4) 1,3-Dichlorobenzene	330.	10.
5) 1,4-Dichlorobenzene	330.	10.
6) Benzyl alcohol	330.	10.
7) 1,2-Dichlorobenzene	330.	10.
8) 2-Methylphenol	330.	10.
9) bis(2-Chloroisopropyl)ether	330.	10.
10) 4-Methylphenol	330.	10.
11) N-Nitroso-di-n-propylamine	330.	10.
12) Hexachloroethane	330.	10.
13) Nitrobenzene	330.	10.
14) Isophorone	330.	10.
15) 2-Nitrophenol	330.	10.
16) 2,4-Dimethylphenol	330.	10.
17) Benzoic acid	1600.	50.
18) bis(2-Chloroethoxy)methane	330.	10.
19) 2,4-Dichlorophenol	330.	10.

CONSTITUENT	LABORATORY DETECTION LIMIT[A]	
	SOIL (ug/kg)[C]	WATER (ug/L)[B]
CLP-SEMI-VOLATILES (CONTINUED):		
20) 1,2,4-Trichlorobenzene	330.	10.[I]
21) Napthalene	330.	10.
22) 4-Chloroaniline	330.	10.
23) Hexachlorobutadiene	330.	10.
24) 4-Chloro-3-methylphenol	330.	10.
25) 2-Methylnapthalene	330.	10.
26) Hexachlorocyclopentadiene	330.	10.
27) 2,4,6-Trichlorophenol	330.	10.
28) 2,4,5-Trichlorophenol	1600.	50.
29) 2-Chloronapthalene	330.	10.
30) 2-Nitroaniline	1600.	50.
31) Dimethyl phthalate	330.	10.
32) Acenaphthylene	330.	10.
33) 2,6-Dinitrotoluene	330.	10.
34) 3-Nitroaniline	1600.	50.
35) Acenaphthene	330.	10.
36) 2,4-Dinitrophenol	1600.	50.
37) 4-Nitrophenol	1600.	50.
38) Dibenzofuran	330.	10.
39) 2,4-Dinitrotoluene	330.	10.

CONSTITUENT	LABORATORY DETECTION LIMIT*	
	SOIL (ug/kg)[C]	WATER (ug/L)[B]
CLP-SEMI-VOLATILES (CONTINUED):		
40) Diethyl phthalate	330.	10.
41) 4-Chlorophenyl phenyl ether	330.	10.
42) Fluorine	330.	10.
43) 4-Nitroanaline	1600.	50.
44) 4,6-Dinitro-2-methylphenol	1600.	50.
45) N-Nitrosodiphenylamine(1)	330.	10.
46) 4-Bromophenyl phenyl ether	330.	10.
47) Hexachlorobenzene	330.	10.[I]
48) Pentachlorophenol	1600.	50.[I]
49) Phenanthrene	330.	10.
50) Anthracene	330.	10.
51) Di-n-butyl phthalate	330.	10.
52) Fluoranthene	330.	10.
53) Pyrene	330.	10.
54) Butyl benzyl phthalate	330.	10.
55) 3,3-Dichlorobenzadine	660.	20.
56) Benzo(a)anthracene	330.	10.
57) Chrysene	330.	10.
58) bis(2-Ethylhexyl)phthalate	330.	10.[I]

CONSTITUENT	LABORATORY DETECTION LIMIT*	
	SOIL (ug/kg)[E]	WATER (ug/L)[D]
CLP-SEMI-VOLATILES (CONTINUED):		
59) Di-n-octyl phthalate	330.	10.
60) Benzo(b)fluoranthene	330.	10.
61) Benzo(k)fluoranthene	330.	10.
62) Benzo(a)pyrene	330.	10.[I]
63) Indeno(1,2,3-cd)pyrene	330.	10.
64) Dibenzo(a,h)anthracene	330.	10.
65) Benzo(g,h,i)perylene	330.	10.
CLP-PESTICIDES/PCBs		
1) Alpha-BHC	8.	.05
2) Beta-BHC	8.	.05
3) Delta-BHC	8.	.05
4) Gamma-BHC (Lindane)	8.	.05
5) Heptachlor	8.	.05
6) Aldrin	8.	.05
7) Heptachlor epoxide	8.	.05
8) Endosulfan I	8.	.05
9) Dieldron	16.	.1
10) 4,4'-DDE	16.	.1

CONSTITUENT	LABORATORY DETECTION LIMIT*	
	SOIL (ug/kg)[E]	WATER (ug/L)[D]
CLP-PESTICIDES/PCBs (CONTINUED):		
11) Endrin	16.	.1
12) Endosulfan II	16.	.1
13) 4,4'-DDD	16.	.1
14) Endosulfan sulfate	16.	.1
15) 4,4'-DDT	16.	.1
16) p,p'-Methoxychlor	80.	.5
17) Endrin ketone	16.	.1
18) Alpha chlordane	80.	.5
19) Gamma chlordane	80.	.5
20) Toxaphene	160.	1.
21) PCB-1016	80.	.5
22) PCB-1221	80.	.5
23) PCB-1232	80.	.5
24) PCB-1242	80.	.5
25) PCB-1248	80.	.5
26) PCB-1254	160.	1.
27) PCB-1260	160.	1.
PESTICIDES/PCBs (EPA 8080/608):		
1) Alpha-BHC	5.	.05
2) Beta-BHC	5.	.05
3) Delta-BHC	5.	.05
4) Gamma-BHC (Lindane)	5.	.05
5) Heptachlor	5.	.05

CONSTITUENT	LABORATORY DETECTION LIMIT*	
	SOIL (ug/kg)[E]	WATER (ug/L)[D]
PESTICIDES/PCBs (EPA 8080/608)		
6) Aldrin	5.	.05
7) Heptachlor epoxide	5.	.05
8) Endosulfan I	10.	.05
9) Dieldron	10.	.1
10) 4,4'-DDE	10.	.1
11) Endrin	10.	.1
12) Endosulfan II	10.	.1
13) 4,4'-DDD	10.	.1
14) Endosulfan sulfate	10.	.1
15) 4,4'-DDT	10.	.1
16) p,p'-Methoxychlor	50.	.5
17) Endrin ketone	10.	.1
18) Alpha chlordane	50.	.5
19) Gamma chlordane	50.	.5
20) Toxaphene	100.	1.
21) PCB-1016	50.	.5
22) PCB-1221	50.	.5
23) PCB-1232	50.	.5
24) PCB-1242	50.	.5
25) PCB-1248	50.	.5
26) PCB-1254	50.	1.[I]
27) PCB-1260	50.	1.[I]

CONSTITUENT	LABORATORY DETECTION LIMIT*	
	SOIL (mg/kg)[f]	WATER (ug/L)[f]
METALS:		
1) Aluminum	2.1	21.4
2) Antimony	3.2	31.5[l]
3) Arsenic	.1	1.2
4) Barium	.09	.9
5) Beryllium	.05	.5
6) Cadmium	.4	4.2
7) Calcium	1.3	13.4
8) Chromium	.4	3.8
9) Cobalt	.3	3.3
10) Copper	.7	7.3
11) Iron	.3	3.2
12) Lead	.09	.9
13) Magnesium	6.8	68.5
14) Manganese	.08	.8
15) Mercury	.1	.2
16) Nickel	1.9	18.6
17) Potassium	174.	1740.
18) Selenium	.1	1.
19) Silver	.5	4.9

CONSTITUENT	LABORATORY DETECTION LIMIT*	
	SOIL (mg/kg)[F]	WATER (ug/L)[F]
METALS (CONTINUED):		
20) Sodium	156.	1560.
21) Thallium	.1	1.1
22) Vanadium	.3	2.6
23) Zinc	.1	1.2
CYANIDE:	.5	10.
PERCENT SOLIDS:	%	%
EPA 8150-CHLORINATED HERBICIDES		
1) 2,4-D	240	1.2
2) 2,4-DB	182	0.91
3) 2,4,5-T	40	0.20
4) 2,4,5-TP (SILVEX)	34	0.17
5) Dalapon	1,160	5.8
6) Dicamba	54	0.27
7) Dichloroprop	130	0.65
8) Dinoseb	14	0.07
9) MCPA	49,800	249
10) MCPP	38,400	192

NOTE:

[A] - Medium Water/Soil/Sediment Contract Required Detection Limits (CRDL) for Volatile HSL Compounds are 100 times the individual Low Water/Soil/Sediment CRDL.

[B] - Medium Water CRDL for Semi-Volatile HSL ompounds are 100 times the individual Low Water CRDL.

[C] - Medium Soil/Sediment CRDL for Semi-Volatile HSL Compounds are 60 times the individual Low Soil/Sediment CRDL.

[D] - Medium Water CRDL for Pesticide HSL Compounds are 100 times the individual Low Water CRDL.

[E] - Medium Soil/Sediment CRDL for Pesticide HSL Compounds are 60 times the individual Low Soil/Sediment CRDL.

[F] - These CRDL are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E (of CLP SOW 2/88). The detection limits for samples may be considerably higher depending on the sample matrix.

[G] - Sample extracted using Method 3510, Separatory Funnel Liquid-Liquid Extraction.

[H] - Sample extracted using Method 3540, Soxhlet Extraction

[I] - Exceeds Primary MCL for this compound.

[*] - Specific Detection Limits are highly matrix dependent. The detection limits listed herein are provided for guidance and & may not always be achievable.

APPENDIX C

DATA VALIDATION AND CLASSIFICATION CHECKLISTS

FIELD DATA VALIDATION CHECKLIST

Project Name: _____
Project Number: _____
Sample Identification: _____
Sampling Team: _____
Analyzing Laboratory: _____
Analyses Performed: _____
Sample Matrix: _____
QA Reporting Level: _____

REPORTING REQUIREMENTS

FIELD DATA PACKAGE DOCUMENTATION	YES	NO	NOT REQUIRED
1. Field (water and soil sample logs completed properly and signed			
2. Sampling dates noted			
3. Sampling team indicated			
4. Sample identification traceable to location collected			
5. Sample location provided			
6. Sample depth for soils indicated			
7. Collection technique (bailer, pump etc.)			
8. Field preparation techniques and sample type indicated (grab, composite)			
9. Sample container type described			
10. Sample container type proper for analysis			
11. Preservation methods indicated			
12. Chain-of-custody form completed			
13. Proper analytical methods requested			
14. Proper number and type of field QC samples were collected (blanks, replicates, splits, etc.)			
15. Field equipment was properly calibrated before use and results documented.			

COMMENTS: _____

_____

FIELD DOCUMENTATION IS COMPLETE: _____

QA Officer

ANALYTICAL DATA VALIDATION CHECKLIST

Project Name: _____
Project Number: _____
Sample Identification: _____
Sampling Team: _____
Analyzing Laboratory: _____
Analyses Performed: _____
Sample Matrix: _____
QA Reporting Level: _____

REPORTING REQUIREMENTS
ANALYTICAL DATA PACKAGE DOCUMENTATION
LEVEL A (QUALITATIVE)

Section I: General Information	YES	NO	NOT REQUIRED
1. Sample results complete			
2. Proper parameters analyzed			
3. Method of analysis reported			
4. Detection limits of analysis reported			
5. Master tracking list provided			
6. Sample collection date provided			
7. Sample received date provided			
8. Sample preparation/extraction date provided			
9. Sample analysis date provided			
10. Copy of Chain-of-Custody form signed by the lab sample custodian			
11. A narrative summary of QA or sample problems is provided			

COMMENTS: _____

Section II: Inorganic Analyses	YES	NO	NOT REQUIRED
1. Results of ICVS and CCVS, %R, expected values			
2. Results of Digested LCS (may be called QC Check sample), %R and expected value			
3. Results of undigested QC Check sample, %R, Source (Lot No. and manufacturer)			
4. Results of method blanks			
5. Results of interference check sample (ICS) and expected value (ICP only)			
6. Results of a dilution check sample and expected value (ICP only)			
7. Results of laboratory duplicate analysis and %RSD or RPD and control			
8. Results of Matrix spike (digested spike) analysis, amount spiked, %R and control limits			
9. Results of analytical (post-digested) spike analysis, amount spiked, %R, and control limits (furnace AAS only)			

COMMENTS: _____

Documentation

Section III: Organic Analyses	YES	NO	NOT REQUIRED
A. GAS CHROMATOGRAPHY (NO MASS SPEC)			
1. Results of water blanks (VOA), Extraction blanks, and/or trip blanks			
2. Results of latest independent QC check samples, expected value %R and source (Lot No. and manufacturer			
3. Results of analysis of reagent water spike, expected value %R, control limits			
4. Results of reagent water spike duplicate, expected value, %R, RPD and control limits			
5. Results of matrix spikes, amount spiked, %R and control limit			
6. Results of matrix spike duplicates, amount spiked, %R, RPD or $RSD and control limit			
7. Results of laboratory duplicates (if performed), RPD or %RSD and control limit			
8. Results of surrogate spikes, %R, control limits			

COMMENTS: _____

Documentation

B. GAS CHROMATOGRAPHY/MASS SPECTROMETER	YES	NO	NOT REQUIRED
1. Verification statement acknowledging tuning with BFB or DFTPP that indicates compliance with acceptance criteria			
2. Results of continuing calibration standards (SPCC and CCC), expected value			
3. Results of water blanks, extraction (method) blanks, and trip blanks.			
4. Results of analysis of reagent water spike, expected value, %R, control limits			
5. Results of reagent water spike duplicate, expected value, %R, RPD, and control limits			
6. Results of matrix spikes analysis, amount spiked, %R, and control limits			
7. Results of matrix spike duplicate analysis amount spiked, %R, RPD or %RSD and control limits			
8. Results of surrogate spike analysis, %R, control limits			
9. Results of latest Independent QC check samples (EPA or NBS traceable) analyzed expected value, and source (Lot No. and manufacturer)			
10. Results of blank spike analysis for matrix spike or matrix spike duplicate parameters not meeting recovery requirements			

COMMENTS: _____

QUANTITATIVE STATISTICAL SIGNIFICANCE
LEVEL B (QUANTITATIVE)

DATA EVALUATION	PASS	FAIL	NOT APP
1. Samples were properly collected			
2. Samples were properly preserved			
3. Field measurements of pH and specific conductance are consistent with historical data			
4. Samples were analyzed by the proper methods			
5. Sample extracted within holding time			
6. Sample analyzed within holding time			
7. Required detection limits were employed by the laboratory			
8. Results of Sampler rinsate blanks were contaminant free or less than five times the detection limit			
9. Sampler rinsate blanks were not contaminant free and field blanks were analyzed properly			
10. Field blanks were contaminant free			
11. Field blanks were not contaminant free and trip blanks were properly analyzed			
12. Trip blanks were contaminant free			
13. Trip blanks were not contaminant free			
14. Laboratory blanks (method blanks, extraction blanks, water blanks) are contaminant free			
15. Blanks summary (conclusions reached): _____			

QUANTITATIVE STATISTICAL SIGNIFICANCE (Continued)
LEVEL B (QUANTITATIVE)

DATA EVALUATION	PASS	FAIL	NOT APP
16. RPD of field replicates is less than 25% for water matrices and less than 40% for soil matrices or the difference can be explained			

COMMENTS: _____

INORGANIC ANALYSES	PASS	FAIL	NA
1. ICVS and CCVD %R within control limits			
2. LCS %R within control limits			
3. QC Check Sample %R within control limits and source given			
4. Laboratory blanks acceptable			
5. Interference Check sample within control limits (ICP only)			
6. Dilution Check sample within control limits (ICP only)			
7. RPD for laboratory duplicate within allowable limits			
8. Matrix spike %R within control limits			
9. Analytical post digested spike within control limits (furnace AAS only)			

COMMENTS: _____

ORGANIC ANALYSES	PASS	FAIL	NA
1. Laboratory blanks are acceptable			
2. QC check samples %R were within control limits and source given			
3. GC/MS properly tuned with BFB or DFTPP			
4. GC/MS continuing calibration (SPCC and CCC) standards within acceptable control limits			
5. Matrix spikes or reagent water spikes %R within control limits			
6. Matrix spike duplicates %R within control limits			
7. RPD of matrix spike duplicate or reagent water spike duplicate was within control limits			
8. Surrogate spikes within control limits			
9. Laboratory duplicates have acceptable RPD			

COMMENTS: _____

DATA VALIDATION QUALIFIER CODES
FOR ORGANIC ANALYSES

The analytical data validation
level is (check one):

EXPLANATION: _____

_____

_____

_____

_____

_____

FINAL CONCLUSION: _____

VALIDATION PERFORMED BY: _____

REPORTING QUALIFIERS:

U code: Indicates that compound was analyzed for but not detected. Report the minimum detection limit for the sample with the U (e.g., I0U) based on necessary concentration/dilution actions. (This is not necessarily the instrument detection limit.) The footnote should read: U-Compound was analyzed for but not detected. The number is the minimum attainable detection limit for the sample.

J code: Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed or when the mass spectral data indicates the presence of a compound the meets the identification criteria but the result is less than the specified detection limit but greater than zero (e.g., 10J)>

C code: This flag applies to pesticide parameters where the identification has been confirmed by GC/MS. Single component pesticides > 19 bg.yk in the final extract should be confirmed by GC/MS.

B code: This flag is used when the analyte is found in the blank as well as a sample. It indicates possible/probably blank contamination and warns the data user to take appropriate action.

E code: Indicates a value estimated or not reported due to the presence of interference. Explanatory note included on cover page.

R code: Indicates spike sample recovery is not within control limits.

s code: Indicates value determined by Method of Standard Addition.

REPORTING QUALIFIERS: (Continued)

* code: Indicated duplicate analysis is not within control limits.

+ code: Indicates the correlation coefficient for method of standard addition is less than 0.995.

Other: Other specific flags and footnotes may be required to properly define the results. If used, they must be fully described and such description attached to the data summary report.

DATA CLASSIFICATION SUMMARY CHECKLIST
Class A Criteria
Matrix: Ground Water

To be classified for Class A use, the data must meet the following criteria:

Criteria	Evaluation Result
1. Sampling dates were recorded;	
2. Signatures of Sampling Team on each water sample log or soil sample log;	
3. Sampling locations were clearly designated and described;	
4. Sampling depth increment for soils was recorded;	
5. Sample collection technique was described on water sample log or soil sample log;	
6. Field preparation techniques were clearly described where applicable;	
7. Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	
8. Shipping bill of lading or constant surveillance documentation is available;	
9. The laboratory sample preparation or extraction date is recorded and available;	
10. The laboratory sample analysis date is recorded and available;	

Class A Criteria (continued)

Criteria	Evaluation Result
11. The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratories approved SOP;	
12. The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	
13. The laboratory analytical detection limits or limits of quantitation (LCQ) are given in lab reports and are adequate for project objectives;	
14. Field records include: • Soil/sediment log sheets • Water sampling log sheets • QC field checklist • Field instrument calibration logs • Master bound log book with sequentially numbered pages • Daily log book • Chain-of-custody forms	
15. All applicable records described above were properly created and are on file;	
16. Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level).	

Remarks:

Conclusion:

DATA CLASSIFICATION SUMMARY CHECKLIST
Class B Criteria
Matrix: Ground Water

To be classified for Class B use, the data must meet the following criteria:

Criteria	Evaluation Result
A. Data Validation Result	
1. Samples of this matrix have not been flagged J or R during data validation;	
2. All samples of this matrix have been classified as Level A data;	
B. Quantitative Statistical Significance	
1. Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	
2. Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	
3. All laboratory procedures were referenced to approved EPA methods and were contained in an approved SOP manual;	
4. Analytical QC data was available to demonstrate proper instrument calibration;	
5. Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	
6. Laboratory reagent (method) blanks were analyzed at frequency of at least 1 per 20 samples;	
7. Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	

Class B Criteria (continued)

Criteria	Evaluation Result
8. Laboratory matrix spikes and matrix spike duplicates were analyzed at a frequency of at least 1 per 20 samples;	
9. Field replicates if required were analyzed at a frequency of at least 1 per 10 samples;	
10. Field blanks were submitted at a frequency of at least 1 per 20 samples;	
11. One trip blank was submitted for VOCs analysis with each cooler;	
12. Field split samples if required were analyzed at a frequency of at least 1 per 20 samples per matrix;	
13. Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	
14. If required for the project, the laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	
15. The laboratories participated in round-robin testing program by WPA or other accrediting agency;	
16. Quality control limits were consistent with or exceed the limits established by the EPA for all methods of analysis or the EPA CLP;	
17. All samples submitted were analyzed for the requested parameters.	

Class B Criteria (continued)

Criteria	Evaluation Result
C. Custody and Document Control	
1. Field custody of all samples was noted in a bound field log book;	
2. Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	
3. Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	
4. Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	
5. Field notebooks, log sheets, log books, checklists, reports, data validations, and custody documents are stored in a secure repository or under the control of a document custodian;	
6. All records, forms log books, etc., are filled out completely in indelible ink without alterations except as initialed;	
7. All sample log sheets have been signed by the sample collector;	
8. Field log book sheets signed by the field sample custodian.	
D. Sample Representativeness	
1. Compatibility exists between field and laboratory measurements or incompatibilities have been suitably explained;	

Class B Criteria (continued)

Criteria	Evaluation Result
2. Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	
3. Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	
4. Proper sample containers were used for the parameters analyzed;	
5. Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	
6. The sample site selection criteria are consistent with the objectives of the investigation and will provide the required data.	

Remarks:

Conclusion:

APPENDIX D

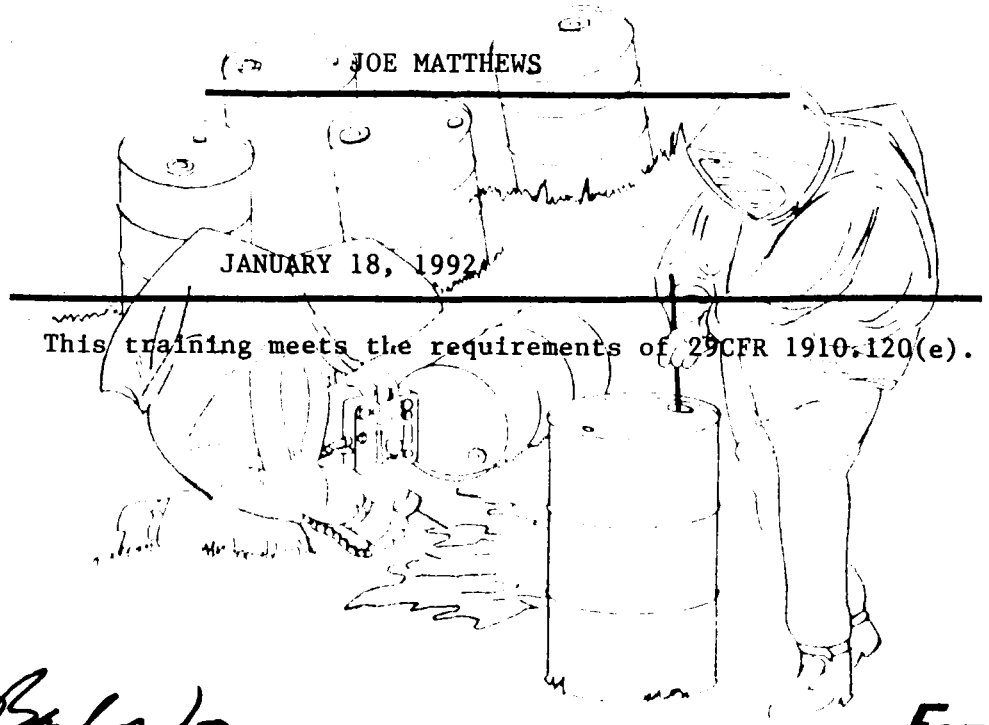
HEALTH AND SAFETY TRAINING CERTIFICATES

CERTIFICATE OF ATTENDANCE

HAZARDOUS WASTE FIELD INVESTIGATION HEALTH AND SAFETY TRAINING

REFRESHER TRAINING

JOE MATTHEWS



JANUARY 18, 1992

This training meets the requirements of 29CFR 1910.120(e).

Instructor Richard Barlow

EnSafe®
Environmental and Safety Designs, Inc.

GERAGHTY
& MILLER, INC.
Ground-Water Services

Certificate of Completion

Presented To

Joseph R. Matthews

July 17-21, 1989

In Recognition of Having Successfully Completed
the Prescribed Course of Study for
Hazardous Waste Site Activities
40-Hour Initial
Health and Safety Training

Andrew J. Barber
Corporate Safety Manager
Geraghty & Miller, Inc.

Kevin J. Dooley
Regional Health and Safety Manager
Geraghty & Miller, Inc.

December 6, 1992

FROM: Phillip G. Coop
President
EnSafe

TO: Training File

SUBJ: Refresher Training, Rick Barlow

1. This is to certify that during 1991, Mr. Barlow fulfilled the refresher training requirement by participating as an instructor in the following courses:

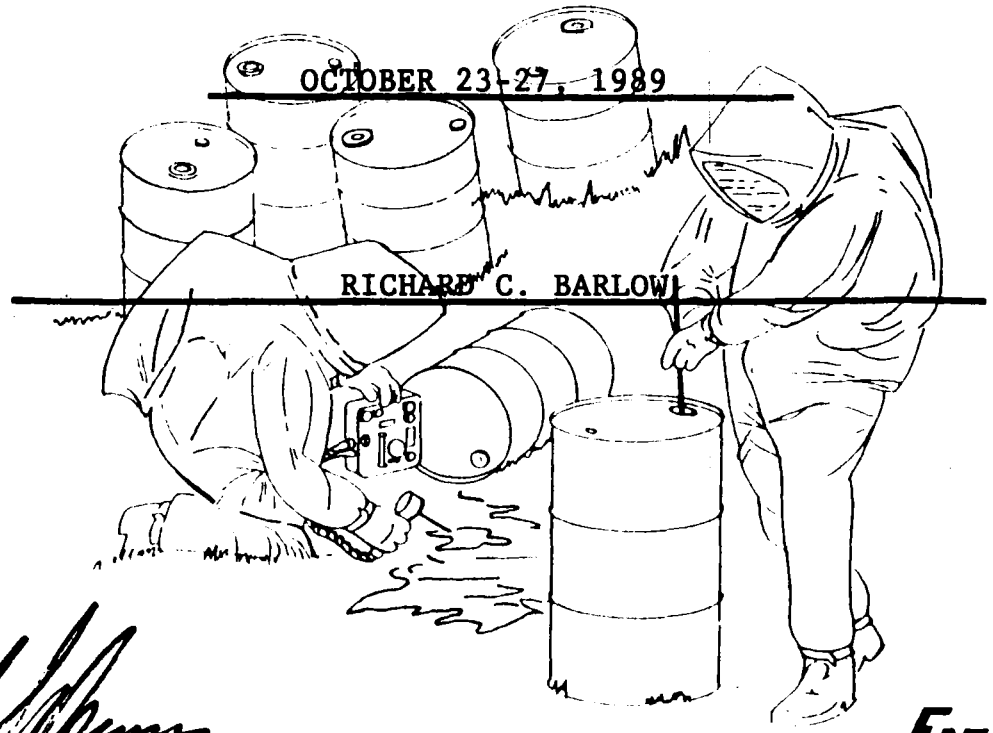
March 1991 -	United Technology - Emergency Response Training
April 1991 -	Four Day - Navy On-Scene Coordinator Course, Washington, DC
May 1991 -	8 Hr. Refresher Training Course, Golden "R" Inc.
August 1991 -	Two Day - Waste Handlers Refresher Training Course - Camp Lejeune
	Three Day - Hazardous Materials Technical Training Course - Memphis, TN
Sept. 1991 -	Four Day - Navy On-Scene Coordinator Course - Seattle, WA
Nov. 1991 -	Four Day - Navy On-Scene Coordinator Course - Virginia Beach, VA

CERTIFICATE OF ATTENDANCE

HAZARDOUS WASTE FIELD INVESTIGATION HEALTH AND SAFETY TRAINING

OCTOBER 23-27, 1989

RICHARD C. BARLOW



Instructor

EnSafe

Environmental and Safety Designs, Inc.

Roy F. Weston, Inc.
Technical Assistance Team
U.S. EPA Region IV

This certifies that

GREG TEMPLE

has completed 8 Hour annual
Health and Safety Refresher Training

Regional Safety Officer

Technical Assistance Team Leader

September 1991

3413

Roy F. Weston, Inc.

This certifies that

GREG TEMPLE

has completed the

REMEDIAL RESPONSE HEALTH AND SAFETY
TRAINING COURSE (RFW 1180.8)

West Chester, Pennsylvania
October 2, 3, 4, 5, and 6, 1989

3.0 CONTINUING EDUCATION UNITS (CEUs) AWARDED

George M Crawford, CIH
Corporate Health & Safety Director

10/06/89
Date

Roy F. Weston, Inc.
Technical Assistance Team
U.S. EPA Region IV

This certifies that

LAWSON ANDERSON

has completed 8 Hour annual

Health and Safety Refresher Training

Scott W. Clarke
Regional Safety Officer

William R. Doyle
Technical Assistance Team Leader

September 1991

2598

Roy F. Weston, Inc.

This certifies that

LAWSON ANDERSON

has completed the

REMEDIAL RESPONSE HEALTH AND SAFETY
TRAINING COURSE (RFW 1180.8)

West Chester, Pennsylvania
February 20, 21, 22, 23, and 24, 1989

3.0 CONTINUING EDUCATION UNITS (CEUs) AWARDED

Roy M. Brauch
Corporate Health and
Safety Director

2/24/89
Date

IV-028

Roy F. Weston, Inc.

This certifies that

LAWSON ANDERSON

has completed the

OSHA 8 HOUR HEALTH AND SAFETY REFRESHER TRAINING H501

OSHA 8 HOUR MANAGEMENT AND SUPERVISOR HEALTH AND SAFETY
TRAINING H503

SEPTEMBER 19,20 1990

Owen B. Dougherty CIH
Corporate Health & Safety Director

9/27/90
Date

APPENDIX E

CHEMICAL INFORMATION

MATERIAL SAFETY
DATA SHEET

JET FUEL JP-4

MSDS NO: 02001526

MANUFACTURER/SUPPLIER:
Amoco Oil Company
200 East Randolph Drive
Chicago, Illinois 60601

EMERGENCY HEALTH INFORMATION: (800) 447-8735
EMERGENCY SPILL INFORMATION: (800) 424-9300
CHEMTREC, U.S.A.
OTHER PRODUCT SAFETY INFORMATION: (312) 856-3907

IMPORTANT COMPONENTS: Petroleum naphtha.
Petroleum distillate.
Benzene (CAS 71-43-2) ACGIH TLV 10 ppm,
OSHA PEL 1 ppm (8-hr. TWA), 5 ppm STEL (15 mins.).

WARNING STATEMENT: Warning! Flammable. Harmful or fatal if swallowed and/or aspirated into lungs. Vapor harmful - High concentrations can cause headaches, dizziness, drowsiness and nausea. Can produce skin irritation upon prolonged or repeated contact.

HMIS/NFPA CODES:(HEALTH;1)(FLAMMABILITY;3)(REACTIVITY;0)

APPEARANCE AND ODOR: Colorless liquid; fuel oil odor.

HEALTH HAZARD INFORMATION

EYE

EFFECT: High concentrations of vapor/mist may cause eye discomfort.

FIRST AID: Flush eyes with plenty of water. Get medical attention if irritation persists.

PROTECTION: None required; however, use of eye protection is good industrial practice.

SKIN

EFFECT: Can cause skin irritation on prolonged or repeated contact. See Toxicology Section.

FIRST AID: Wash exposed skin with soap and water. Remove contaminated clothing, including shoes, and thoroughly clean and dry before reuse. Get medical attention if irritation develops.

PROTECTION: Wear protective clothing and gloves if prolonged or repeated contact is likely. Avoid prolonged or repeated skin contact.

INHALATION

EFFECT: Vapour harmful. High vapor concentrations can cause headaches, dizziness, drowsiness and nausea. See Toxicology Section.

FIRST AID: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get medical attention.

PROTECTION: Avoid breathing vapor and/or mist. Use with adequate ventilation. If ventilation is inadequate, use NIOSH/MSHA certified respirator which will protect against organic vapor/mist.

HEALTH HAZARD INFORMATION - CONTINUED

INGESTION

EFFECT: Low viscosity product. Harmful or fatal if aspirated into lungs.

FIRST AID: If swallowed, do NOT induce vomiting. Get immediate medical attention.

FIRE AND EXPLOSION INFORMATION

FLASHPOINT: -10°F TO 30°F, (CC) Range

FLAMMABLE LIMITS: UPPER: 8% LOWER: 1.3%

AUTOIGNITION TEMPERATURE: 468°F

EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, halogenated agents, foam, steam) and water fog.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable liquid. Vapor may explode if ignited in enclosed area.

PRECAUTIONS: Keep away from ignition sources (e.g., heat, sparks and open flames). Keep container closed. Use with adequate ventilation.

REACTIVITY INFORMATION

DANGEROUS REACTIONS: None identified.

HAZARDOUS DECOMPOSITION: Burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

STABILITY: Stable.

CHEMICAL AND PHYSICAL PROPERTIES

BOILING POINT: 250°F TO 549°F, Range

SOLUBILITY IN WATER: Negligible, below 0.1%.

SPECIFIC GRAVITY (WATER = 1): 0.75 TO 0.8

VAPOR PRESSURE: 2-3 psi @ 100°F

STORAGE AND ENVIRONMENTAL PROTECTION

STORAGE REQUIREMENTS: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable federal, state, or local regulations.

SPILLS AND LEAKS: Remove or shut off all sources of ignition. Increase ventilation, if possible. Use water spray to disperse vapors.

WASTE DISPOSAL: Disposal must be in accordance with applicable federal, state, or local regulations. Enclosed-controlled incineration is recommended unless directed otherwise by applicable ordinances.

SPECIAL PRECAUTIONS: Avoid strong oxidizers.

TOXICOLOGICAL INFORMATION

Skin: From skin-painting studies of petroleum distillates of similar composition and distillate range, it has been shown that these types of materials often possess weak carcinogenic activity in laboratory animals. Therefore, there may be a potential risk of skin cancer from prolonged or repeated skin contact with this product in the absence of good personal hygiene.

Occasional skin contact with this product is not expected to have serious effects, but good personal hygiene should be practiced and repeated skin contact avoided. This product can also be expected to produce skin irritation upon prolonged or repeated skin contact. Personal hygiene measures taken to prevent skin irritation are expected to be adequate to prevent risk of skin cancer.

Excessive exposure to vapors may produce headaches, dizziness, nausea, drowsiness, irritation of eyes, nose and throat and central nervous system depression.

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product.

Jet Fuel JP-4 is a complex mixture of hydrocarbons and contains benzene (up to approximately 2%). Chronic exposure to high levels of benzene has been shown to cause cancer (leukemia) in humans and other adverse blood effects (anemia). Benzene is considered a human carcinogen by IARC, NTP and OSHA.

Materials of this type have been shown to produce kidney damage in male rats following prolonged inhalation exposures. Following extensive research, this effect appears to be unique to the male rat and is considered to be of little or no relevance in terms of human health risk.

REGULATORY INFORMATION

CERCLA REPORTABLE QUANTITY:
This product is exempt from the CERCLA reporting requirements under 40 CFR Part 302.4. However, if spilled into waters of the United States, it may be reportable under 33 CFR Part 153 if it produces a sheen.

DOT PROPER SHIPPING NAME: Fuel, Aviation, Turbine Engine, Flammable Liquid, UN1863.

OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. Irritant. Contains a carcinogenic component.

RCRA STATUS:
This product is subject to the 40 CFR Part 268.30 land ban on the disposal of certain hazardous wastes because it contains the following substance(s):

COMPONENT/CAS NUMBER
Ethylbenzene (100-41-4)
Toluene (108-88-3)
Xylene (1330-20-7)

SARA STATUS:
This product is regulated under the following section(s) of SARA Title III, 42 USC 9601. Spills or releases of the product may be reportable as determined by the information given below:

REGULATORY INFORMATION - CONTINUED

SARA STATUS (continued):

SECTIONS 311 AND 312 OF SARA AND 40 CFR PART 370:
This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

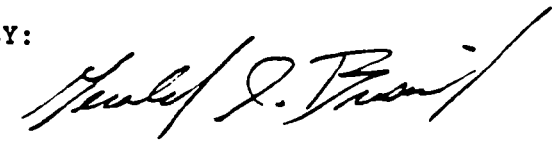
SECTION 313 OF SARA AND 40 CFR PART 372:
This product contains the following substances, which are on the Toxic Chemicals List in 40 CFR Part 372:

COMPONENT/CAS NUMBER	WEIGHT PERCENT
Benzene (71-43-2)	4
Ethylbenzene (100-41-4)	2
Toluene (108-88-3)	22
Cyclohexane (110-82-7)	5
Xylene (1330-20-7)	10
MTBE (1634-04-4)	7

TSCA STATUS: All of the components of this product are listed on the TSCA Inventory.

ISSUE INFORMATION

BY:



G. I. Bresnick, Director
Product Stewardship & Toxicology

ISSUED: August 29, 1989
SUPERSEDES: February 02, 1989

JET FUELS: JP-4

JPF

Common Synonyms	Watery liquid	Colorless	Fuel oil odor
	Floats on water.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Miscellaneous Hydrocarbon Mixtures
3.2 **Formula:** C_nH_{2n+2}
3.3 **IMO/UN Designation:** 3.2/1863
3.4 **DOT ID No.:** 1863
3.5 **CAS Registry No.:** Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless to light brown
4.3 **Odor:** Like fuel oil

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.
5.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.
5.3 **Treatment of Exposure:** ASPIRATION: enforce bed rest; administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water.
5.4 **Threshold Limit Value:** 200 ppm
5.5 **Short Term Inhalation Limits:** 2500 mg/m³ for 60 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 1 ppm
5.11 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** —10°F to +30°F C.C.
6.2 **Flammable Limits in Air:** 1.3%-8.0%
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 464°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 33

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 500 ppm/*/salmon fingerling/lethal/fresh water
*Time period not specified
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 53%, 5 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** 100%
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** Not pertinent
12.3 **Boiling Point at 1 atm:** 349-549°F = 176-287°C = 449-560°K
12.4 **Freezing Point:** < —54°F = < —48°C = <225°K
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 0.81 at 20°C (liquid)
12.8 **Liquid Surface Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** (est.) 50 dynes/cm = 0.05 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.030
12.12 **Latent Heat of Vaporization:** 140 Btu/lb = 78 cal/g = 3.3×10^4 J/kg
12.13 **Heat of Combustion:** —18,540 Btu/lb = —10,300 cal/g = -431.24×10^3 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** Data not available

NOTES

APPENDIX F

NAS MEMPHIS EMERGENCY RESPONSE PROCEDURES

HAZARDOUS MATERIALS - COMPANY RESPONSE PROCEDURES

PURPOSE: To assure the maximum safety of personnel during responses to known hazardous materials incidents.

Companies will be notified of the existing weather conditions by Fire Alarm. Companies will approach the incident from the "UPWIND" direction.

NO FIRE DEPARTMENT PERSONNEL ARE TO APPROACH A KNOWN HAZARDOUS MATERIALS AREA WITHOUT FIRST IDENTIFYING THE MATERIALS AND DETERMINING THE RELATIVE SAFETY OF THE AREA.

Companies will stop apparatus well away (200'- 500') from the incident scene to determine the relative safety of approaching the incident area. The first arriving company will radio his position and status. Later arriving companies will radio their position and await orders from the incident commander.

The first arriving officer (Incident Commander) will attempt to safely isolate the immediate area, evacuate the immediate area, and identify the materials involved WITHOUT COMPROMISING THE RELATIVE SAFETY OF FIRE PERSONNEL AND CIVILIANS. The officer should utilize the Public Address system on his apparatus and order all people away from the area. Persons with incident knowledge should be asked to report to the apparatus in order to determine from them, if possible, the nature of the materials. Should no knowledgeable person be found in the immediate area of the incident, the officer should attempt to identify the materials WITHOUT UNNECESSARY APPROACH TO THE IMMEDIATE AREA. If necessary, the officer should await the arrival of binoculars with which to view the area.

The Incident Commander shall establish a Command Post from which to direct the on-going operations. The Incident Commander shall establish a Level II Staging Area from which to deploy apparatus. The Staging Area for most incidents should be at least 1/2 mile from the incident according to Federal Laws.

The incident will be stabilized according to the options available to the incident commander. In many cases, ISOLATION and NONACTION will comprise the roll of the fire department. The Incident Commander shall ask that the responsible shipper or company request the response of a hazardous materials clean-up company. Should the shipper or company refuse that request, the Incident Commander shall request such clean-up company be dispatched.

Necessary authorities (Police, Health, TEMA, etc.) shall be requested. Area evacuation shall be coordinated through the IC until the incident is concluded. If evacuation is required, the IC shall designate an Evacuation Officer (Radio call "Evac"), who shall secure appropriate facilities for evacuated people. Evacuated persons shall be directed to this location. NOTE: Fire Stations may be considered for small numbers of evacuees.

Refer to haz-mat training bulletins for specific incident situations and procedures.

STAGING OF PERSONNEL AND APPARATUS AT INCIDENTS

PURPOSE: To afford the incident commander the ability to properly organize the emergency scene, and to allow apparatus to reposition effectively.

NOTE: This procedure shall not apply in incidents where designated Set-ups have been established.

LEVEL I STAGING (NO STAGING AREA)- To be used on all 1st alarm responses by Companies. The 1st and 2nd Engine and 1st Truck company will begin work according to standard procedures and the action plan ordered by the incident commander (Co. officer, Batt. Comm., or Div. Chief). Later arriving companies shall locate so as to re-position their apparatus if needed. Company Officers will contact the Incident Commander on their Handi-Talkie position #6 for orders. Ex: "Engine 10 to Command, Orders?" If ordered to "stand by", later arriving companies will remain intact at or near their apparatus awaiting orders for deployment. In most cases, officers will be contacted by radio when ordered into the operation. If the incident commander is the 1st arriving officer, he must remember that later arriving companies are not going to deploy without his order, so be sure to have an action plan in mind.

NOTHING SHOWING MODE- In situations where the first arriving company reports "Nothing Showing", the same procedure as listed above shall be used. Later arriving companies shall await orders by the Incident Commander before deploying.

LEVEL II STAGING (DESIGNATED STAGING AREA)- This is a designated staging area which has been established through the Incident Commander. Fire Alarm shall automatically dispatch a Battalion Commander who, upon arrival, shall assume command of the Staging Area from the Staging Officer. Companies responding to Level II Staging will switch their apparatus radios to fireground (F4) frequencies after reporting at staging. The 1st Driver to arrive in staging will assume the role of Staging Officer and document apparatus available to the incident. The Staging Officer must monitor both radio positions #5 and #4 in order to communicate with Fire Alarm and the Incident Commander. As apparatus is ordered into the incident, the Staging Officer will inform Fire Alarm on radio position #5. Such confirmation allows Fire Alarm to monitor apparatus levels remaining in Staging. Should the Driver, acting as Staging Officer, be ordered into the incident, another Driver shall assume the role and continue the staging operation and documentation until relieved of command. The Staging Officer's radio designation shall be "STAGING".

FIRE ALARM REPLENISHMENT OF LEVEL II STAGING- Once Level II Staging is established, Fire Alarm will continue to automatically replenish the Staging Area with Companies until the incident is declared under control. When a greater alarm assignment of Engines is achieved, Fire Alarm will advise the Incident Commander that the incident is now a "(#) Alarm". Example: "Alarm to Command, be advised that the incident is now a 2nd Alarm."

NOTE: Companies awaiting deployment must be patient and remain ready as a Company. If the Company is staged, get your equipment ready (airmask, tools, etc.) and wait until ordered to deploy.

REHABILITATION OF PERSONNEL AT INCIDENTS
(Rehab Sector)

PURPOSE: To provide personnel with effective safety monitoring of health and physical readiness.

A REHAB SECTOR is an area established during an incident where personnel receive necessary rest, nourishment, comfort, and medical evaluation to properly ready them for another work cycle. It is necessary for the effective safety monitoring of personnel.

A REHAB SECTOR shall be established on all multiple alarm incidents and other large-scale or lengthy operations (fires, haz-mat, disaster, etc.). The Incident Commander will determine when a REHAB SECTOR is needed during other incidents.

Company and Commanding Officers should monitor all situations and personnel closely and prepare to REHAB at regular intervals during incidents. Workers suffering from fatigue and stress can become ineffective, and at worst, can become victims themselves. Some factors that contribute to these conditions are work load, temperature, type of emergency and mental condition of the workers. Personnel should be instructed to rest (REHAB) at approximately 30-minute intervals, or more often if necessary.

The REHAB SECTOR shall be located outside the incident perimeter and manned by Paramedics and/or Paramedic Supervisors. The radio designation shall be "REHAB". All personnel entering the REHAB SECTOR shall have an Initial Patient Survey (IPS) performed by the Paramedics before returning to work. This could include vital signs, heart monitoring and other medical assessment or procedures as deemed necessary.

Procedures to be considered by the REHAB OFFICER to meet these objectives would be removal of turn-out clothing, adequate food and water, protection from the heat or cold, refilling and servicing of SCBA, mental condition of workers, and any other personal safety factors.

ENGINE COMPANY OPERATIONS: OFFENSIVE MODES

PURPOSE: To guide basic engine company operations during 1st alarm response.

NOTE: These procedures WILL NOT apply in those cases where a predetermined setup has been designed, or in those instances where the company officer determines that he must act independently from them because of circumstances unique to the situation.

1ST ARRIVING ENGINE- APPARATUS POSITIONING

SMALL RESIDENTIAL AND SMALL COMMERCIAL STRUCTURES- Position just beyond the structure so that the officer can view three (3) sides of the building while arriving. Such positioning will also prevent blocking access to the front of the building.

LARGE RESIDENTIAL, APARTMENTS, AND LARGE COMMERCIAL- Position just beyond the area in which attack operations will be initiated, generally the front doors or frontal openings.

1ST ARRIVING ENGINE- OPERATIONS (ATTACK)

The 1st arriving Engine should approach operations through a perspective of quick attack. That is, the Officer should realize that, in most cases, operations can be initiated which will apply a quick, aggressive attack on the fire utilizing existing tank water (500 Gallons or more). This does not mean that the Officer cannot "lay out" to the hydrant if he so desires, but the Officer should realize that such a decision will delay water application for a number of minutes. Thus, the 1st Engine Officer may wish to generate an immediate, although not complete, effect on the fire by laying his preconnected lines and applying water. He may then lay additional hose as he thinks necessary and call for a continued water supply (SUPPLY LINES) from the 2nd arriving engine. It will be the commitment of the incident commander to assure that the water supply of the 1st Engine is continued should the 1st Officer commit himself to a quick attack.

The Company must also realize their responsibility to conduct initial search/rescue of immediate victims, regardless of the fact that the 2nd Engine is responsible for systematic search.

BASIC FIRE ATTACK WITH HANDLINES- THE STANDARD FIRE ATTACK APPROACH SHALL BE TO ADVANCE ON THE FIRE FROM THE UNBURNED PORTION OF THE FIRE BUILDING.

AT NO TIME SHALL OPPOSING HOSE LINES BE ADVANCED INTO A FIRE BUILDING WHICH WOULD JEOPARDIZE THE SAFETY AND OPERATIONS OF FIRE COMPANIES.

Exceptions to this guideline may be implemented by the Company Officer of the attack, if he can reasonably determine that there are no victims within the building, that the building does not possess any significant property which may be damaged by

alternative attack methods, and that the relative safety of fire personnel is assured. (Example: Vacant buildings, under demolition, construction, etc.). In other words, the Company Officer, in such cases, can order a direct attack on the fire without going through the unburned portions of the building.

It must be noted that attacking fire by this guideline will best assure the survivability to fire victims by keeping, as much as is possible, fire, heat, and smoke away from the unburned areas of the fire building.

2ND ARRIVING ENGINE- OPERATIONS (SUPPLY)

The 2nd arriving Engine (Supply Engine) will be responsible for maintaining the water supply of the 1st Engine, unless ordered otherwise by the incident commander. Therefore, the 2nd arriving Engine should approach the scene and position the apparatus in such a way as to gain access to a fire hydrant. In some cases the 2nd Engine will not be able to access a fire hydrant by passing the 1st Engine. In this instance, this will require the apparatus to back into position.

Anticipated water flows of less than 500 GPM (< 500 GPM) will require one (1) 2 1/2" supply line. Water flows of 500-1000 will require two (2) 2 1/2" supply lines. Water flows of 1000-1500 will require three (3) 2 1/2" supply lines. AT NO TIME WILL THE 1ST ENGINE BE ALLOWED TO RUN OUT OF WATER.

The Incident Commander shall order the laying of supply lines. In such case, the Driver and Assistant Driver shall carry out the order, and the officer and fire fighter(s) shall report to the incident commander for orders. Should the officer be ordered to lay additional hose lines to the fire, the hose will be laid off of the 1st engine (attack engine). If no additional hose is to be laid, the Officer and Fire Fighter shall conduct their required search/rescue within the building.

3RD ARRIVING ENGINE- OPERATIONS (SUPPORT/SPRINKLER SUPPLY)

The 3rd arriving engine shall have the primary responsibility of supplying the sprinkler system when the structure possesses a system. The Officer will report such intent to the Incident Commander and suggest other support activities which he deems necessary (laying out, water supply, search, etc.).

Where no sprinkler system exists, the 3rd arriving engine, unless otherwise ordered, should attempt to position itself on the opposite side of the building from the 1st arriving engine. The officer will evaluate the situation in that sector and report his findings to the incident commander or the sector commander (if the fire is sectored). The officer will initiate operations in that sector when ordered. The operations of the 3rd arriving engine will generally require that he maintain his own water supply (laying out to plug) unless the water supply can be gained from the 1st or 2nd engine.

SUMMARY: 1ST ENG.-ATTACK, 2ND ENG.-SUPPLY, 3RD ENG.-SUPPORT.

INVESTIGATIONS OF FIRE SCENES - COMPANY PROCEDURES

PURPOSE: To maintain fire scene integrity for investigation.

ONCE THE FIRE IS KNOCKED DOWN, NO DEBRIS, FURNISHINGS, OR OTHER INTERIOR MATERIALS SHALL BE REMOVED UNTIL THE SCENE HAS BEEN INVESTIGATED AND A DETERMINATION OF "POINT OF ORIGIN" AND "CAUSE" HAS BEEN MADE.

EXTINGUISHMENT EFFORTS MUST BE ATTEMPTED WHICH WILL LEAVE FURNISHINGS AND MATERIALS IN PLACE UNTIL THE INVESTIGATION IS COMPLETE.

IT IS THE RESPONSIBILITY OF THE COMPANY OFFICER IN THE FIRE AREA TO ADVISE THE INCIDENT COMMANDER OF FIRE KNOCKDOWN IN THAT AREA SO THAT THE INVESTIGATION CAN BE INITIATED, AND TO PRESERVE THE FIRE AREA FOR THE INVESTIGATION PROCESS.

In cases where fatalities are encountered, the fire scene must be secured as early as possible. After fire knockdown, fire personnel and all other people must vacate the fire area until an investigation can be completed. The Incident Commander shall secure the scene by leaving one or few firefighters in the fire area with a hoseline with which to extinguish spot fires. Additionally, fire personnel will be assigned at all entry points to the structure to assure that no unauthorized personnel enter the structure until the investigation is complete.

NAS MEMPHIS OIL SPILL AND HAZARDOUS SUBSTANCE POLLUTION CONTINGENCY PLAN

DEPARTMENT OF THE NAVY
NAVAL AIR STATION MEMPHIS
MILLINGTON, TENNESSEE 38054-5000

NASMFSINST 5100.7D CH-1
Code 010
12 NOV 1991 (R

NAS MEMPHIS INSTRUCTION 5100.7D

From: Commanding Officer

Subj: OIL SPILL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN

Ref: (a) National Contingency Plan (40 CFR 300)
(b) OPNAVINST 5090.1A (R
(c) SOUTHNAVFACENGCOMINST 5090.1A
(d) OPNAVINST 3100.6E
(e) NASMFSINST 5090.1A
(f) NAVHOSPMILLINST 3440.1N (R

Encl: (1) Emergency Notification List
(2) Materials and Equipment List for Safe Emergency Response
(3) OPREP-3 Navy Blue Message Format
(4) Hazardous Substance Release Message Format

1. Purpose. To publish policy concerning a coordinated response to control and contain oil, hazardous substances (HS), and polychlorinated biphenyl (PCB) spills; protect the public health and safety during such spills; and to recover and restore the environment following a spill within the NAS Memphis jurisdiction.

2. Cancellation. NASMFSINST 5100.7C

3. Discussion

a. Oil, PCB, and HS pollution regulations are extremely stringent inasmuch as discharges of these pollutants to the environment can create serious, visible, and lasting effects on human health and wildlife; alter human food resources; and render streams, ponds, and rivers unusable by the public and wildlife. In addition, such spills present an opportunity for fire, explosion, and other hazardous conditions.

b. The control, containment, and cleanup process is costly, time-consuming, and often difficult. The effects of such spills have resulted in claims against the U.S. Government. An additional consequence is the adverse public relations impact upon the Navy.

c. The Navy's most serious spill problem is not the massive spills but the detrimental small oil spills and releases of HS through human error and lack of care and concern for the environment. Most of these small oil spills and HS releases can be prevented by simple and sensible housekeeping practices such as:

(1) Collecting and turning in used motor oil and used hydraulic oil to the Base Auto Hobby Shop or Automotive Center.

(2) Collecting and turning in excess or waste paint, paint thinner, solvents, and other HS to the activity hazardous waste coordinators (HWC's).

(3) Reporting any unusual or suspected oil and HS spills in the area to the NAS Memphis Public Works Department (tel. 873-5462), or the NAS Memphis Fire Department (tel. 9-911).

4. Policy

a. NAS Memphis will fully support and implement the requirements of references (a) through (f).

b. Pollution of the air, water, and ground will not be condoned. The deliberate discharge of oil, PCB, or HS in any amount to surface drainage is prohibited. Where oil, PCB, or HS is spilled, immediate containment, clean-up, and physical removal will be accomplished in accordance with this contingency plan. Because of the hazardous effect to the environment and public health, a comprehensive clean-up of the spill area and verification of the effectiveness of the clean-up process via sampling and laboratory analysis must be insured.

c. Prevention of injury or hazardous exposure to personnel will be the primary concern of the NAS Memphis response organization. In the event of injury to or hazardous exposure of personnel, Naval Hospital, Millington, (tel. 873-5801/5802) must be notified immediately in order that prompt medical assistance and treatment can be accomplished.

d. The policies and responsibilities established in this instruction shall be fully implemented in conjunction with those described in Figure 1, which establishes the NAS Memphis response organization, and paragraph 6, which outlines the functions and responsibilities of the Navy On-Scene Commander (NOSCDR) and On-Scene Operations Team (OSOT) members.

5. Contingency Plan. This Contingency Plan applies to oil, PCB, and HS spills occurring at NAS Memphis and all tenant activities. A separate instruction for spills in HW storage facilities is covered under reference (e). Names, organizations, and telephone numbers are provided in enclosure (1) (Emergency Organization) and are for reporting any of the emergency conditions discussed below. This Contingency Plan must be implemented under the following conditions:

a. Oil discharges. This applies to oil of any kind or in any form, including but not limited to petroleum fuel oil, sludge, oil refuse, distillate, jet fuel, gasoline, lubricating oil, and oil mixed with waste other than dredged spoil.

(1) Minor discharge. A discharge of less than 1,000 gallons of oil.

(2) Medium discharge. A discharge of 1,000 to 10,000 gallons of oil.

(3) Major discharge. A discharge of more than 10,000 gallons of oil.

b. Fire/Explosion

(1) Which causes release of toxic fumes from burning oil, PCB equipment, or HS to the environment, and/or injury or exposure to hazardous/toxic fumes to personnel.

(2) Which spreads beyond area of ignition.

(3) Which threatens off-base property.

(4) When fire fighting agents result in contaminated run-off.

(5) With imminent threat of explosion.

c. PCB or HS Spills or Leaks

(1) When fire or toxic fume hazards exist due to spilled oil, PCB, or HS.

(2) When spills or leaks result in injury or hazardous exposure to personnel.

R) (3) With reportable quantity of PCB leak (1 pound), or other HS leak occurs.

(4) When ground water may be threatened.

(5) When spill threatens off-base property.

(6) When spill threatens waterways and sewage system.

d. Destructive Weather

(1) When destructive weather threatens oil, PCB, and HS storage buildings.

(2) When potential exists for surface water contamination by oil, PCB, and HS.

6. Responsibility. Response to the control, containment, and cleanup of oil, PCB, and HS spills is a team effort. To accomplish the primary goal, i.e., protect the public health and the environment, requires an effective integrated team. The NAS Memphis OSOT organization (Figure 1) is structured to provide a coordinated in-house response to such emergencies.

R) a. The Commanding Officer or the Executive Officer is the NOSCDR responsible for directing and coordinating all spill response actions; and for activation, when necessary, of the OSOT. The Public Works Officer (PWO) or in his/her absence the Public Works Engineering Environmental Chief shall act as the alternate NOSCDR.

b. The NAS Memphis Fire Department Chief as the Immediate Response Teams (IRT) Leader shall assume on-scene command of all response operations until the NOSCDR or the alternate NOSCDR arrives at the spill scene. The Fire Department, always on a 24-hour alert and having trained and designated IRT, is ideally suited for emergency response to oil, PCB, and HS spill and containment, especially after working hours, during weekends, and holidays.

c. The Cleanup Team is responsible for the decontamination and cleanup of any oil, PCB and HS spills, for ensuring that test samples are taken of the soil and surface area, and that EPA and OSHA requirements for a safe and clean environment are complied with after a spill. The Cleanup Team Leader will be the Hazardous Waste Coordinator. The team will be activated utilizing base resources such as the Construction Battalion Unit (CBU) 404 and Multi-Function Facilities Support Services (MFSS) contractor personnel. Where in-house assets are insufficient, services of EPA - certified spill cleanup contractor will be secured. For spills of catastrophic proportion, Navy, EPA, and State of Tennessee Regional Response Team support will be obtained by the NOSCDR through the NOSC - CNTECHTRA. (R

d. In the event of an oil, PCB, or HS spill which meets the contingency criteria, the following responsibility and emergency procedures must be implemented:

(1) NOSCDR - CO or XO

(a) Direct and coordinate all spill response actions.

(b) Activate all or part of the OSOT during an incident response.

(c) Coordinate all required off-base notifications to Navy, Federal, state, or local agencies and the news media with the NOSC (CNTECHTRA).

(d) Coordinate all required off-base assistance from Navy, Federal, state, or local response organizations and private contractors with the area NOSC.

(2) PWO/PWEC (R

(a) Act as the alternate NOSCDR in the event that the NOSCDR is unavailable or delegates his/her responsibility.

(b) Evaluate the severity and hazard of the spill and determine the response necessary for containment and recovery.

(c) Advise the NOSCDR as to the need to activate the OSOT.

(d) Furnish the NOSCDR technical and environmental expertise relative to pollution control techniques.

(e) Coordinate sampling and testing of the affected lands and/or waterways, to monitor the extent and/or degree of pollution caused by the spill, including periodic sampling of on-base waterways for background information.

(f) At the request of the NOSCDR, provide personnel, transportation, and equipment for containment, cleanup, and restoration of landscape due to oil, PCB, and HS spills that exceed the capability of NAS Memphis.

(g) Plan, program, and construct temporary or permanent interception devices to prevent potential spills from entering waterways, utilizing CBU-404, or private contractor services.

(h) Advise the NOSCDR of personnel and equipment requirements that exceed base capability.

(3) NAS Memphis Fire Department Chief

(a) Assume on-scene command of all response operations until the NOSCDR or the alternate NOSCDR arrives at the spill scene. Acts as second alternate NOSCDR. Designated leader of the IRT team.

(b) Immediately contain oil, PCB, or hazardous substance spills to prevent further spread of spill and to protect life and property. Perform cleanup operations of small spills without jeopardizing fire fighting capabilities if and only when it is absolutely necessary to safeguard human life and health or the environment from further spill complication.

(c) Designate, train, and maintain an IRT team on 24-hour alert, fully equipped with hazardous material equipment, responsible for providing initial control and emergency rescue, and for eliminating the hazard condition.

(d) Monitor the air at the spill site to measure toxic and explosive vapor concentration and define a hazardous area as necessary to assist the NOSCDR in establishing hazard and evacuation zones.

(e) Activate the Disaster Preparedness Plan as necessary.

(f) Ensure that materials and equipment listed in enclosure (2), as a minimum, are on hand for emergency.

(g) The IRT of the Fire Department will be responsible for setting up the Command Post at the scene of the spill. One representative from each of the NAS Memphis OSOT will report to the NOSCDR at the command post for coordination of efforts. All other members of the OSOT will stand by in their designated staging area for assignments by their Team Leaders.

(4) Disaster Preparedness Officer

(a) Ensure that the NAS Memphis Disaster Preparedness Plan (DPP) is coordinated with the spill Contingency Plan if the DPP needs to be activated.

(b) Provide training and preparedness involving decontamination for nuclear, biological, or chemical disaster incidents.

(5) NAS Memphis Security Officer

(a) Provide immediate response to all spill emergency calls to isolate the spill area, control traffic, and assist when site evacuation is required, as directed by the NOSCDR.

(b) Immediately isolate and barricade an area 50 feet around and away from suspected contaminated area. This is to prevent unauthorized and unprotected personnel from getting contaminated with PCB and toxic substances and to prevent further spread of contamination.

(c) Allow only those personnel absolutely necessary for official performance of duty to enter the isolated area.

(d) Ensure security units are familiar with potential oil, PCB, and HS spill areas and report those areas that appear to be suspect.

(6) Safety Officer. Provide technical assistance and advice to the NOSCDR concerning safety methods and techniques, and hazardous material information system (HMIS) regarding the hazards and toxicity of the spilled substance.

(7) Naval Hospital, Millington

(a) Provide medical assistance and advice as necessary per reference (f) upon request of NOSCDR to ensure prompt and effective care of injured personnel.

(b) Ensure adequate training and strict control measures to minimize hazardous risks to hospital personnel and the public.

(c) Provide current and follow-up information on injured personnel for reporting purposes as required.

R) (8) Cleanup/Decontamination Team Leader (HWC)

(a) Direct cleanup operations and/or support contractor cleanup operations.

(b) Determine the adequacy of the ultimate cleanup effort and advise the PWO and NOSCDR of the need or scope of any additional cleanup.

(c) Ensure proper containerization and disposal of all HW resulting from the spill.

(d) Maintain official records and photographs documenting the extent of the spill and all containment, cleanup, and recovery actions taken and procedures used.

(e) Ensure that materials and equipment listed in enclosure (2), as a minimum, are on hand for small or initial cleanup and decontamination.

(f) Notify Naval Legal Service Office (tel. 873-5794) of potential claimants incidental to the spill incident.

(9) Public Affairs Officer

(a) Respond to all oil, PCB, and HS spills at the request of the NOSCDR.

(b) Keep abreast of all NAS Memphis actions during a spill to be able to provide prompt and accurate information to concerned parties on the nature of the spill and the steps being taken to correct the problem.

(c) Clear all news media releases involving NAS Memphis actions with the NOSCDR.

(d) Prepare and direct a public awareness program to inform NAS Memphis personnel about spill prevention programs and individual responsibilities in initial spill response.

(10) Naval Legal Service Office. Claims Division

(a) Respond to all oil, PCB, and HS spills at the request of the NOSCDR to ensure that all necessary legal information, records, and samples are obtained and safeguarded for possible future use in legal actions or for purpose of cost recovery from or by the Navy.

(b) Advise the NOSCDR on the legal aspects of spill response when parties other than the Navy are responsible for the spill.

(c) Assist personnel conducting JAGMAN investigations to ensure comprehensive and timely reporting.

(11) Supervisory Personnel at Spill Location

(a) Report any oil, PCB, or HS spill immediately by telephone to the NAS Memphis Emergency Response Organization listed in enclosure (1), Part A - Immediate Notification Sequence.

(b) Coordinate all immediate actions to be taken by site personnel in case of an oil, PCB, or HS spill. Evacuate area to a safe distance upwind and upgrade from the spill. Restrict all sources of ignition - smoking, combustible engines, and open flames.

(c) In the event that the hazards of a spill is undetermined, the incident must be treated as hazardous until test results indicate otherwise.

(d) Ensure that site personnel stay away from the area of contamination and that measures are immediately taken to prevent further spread of contamination.

(e) Advise the NOSCDR and EC of the spill situation and facilities information during response operations.

7. Notification

a. The first person aware of the spill or a potential spill shall immediately notify the NAS Memphis Emergency Response Organization listed in enclosure (1), part A, directly by telephone. The report should contain pertinent information concerning oil, PCB, or HS spills:

(1) Location of spill.

(2) Identity of spilled material, if known.

(3) Quantity of spill.

(4) Type of assistance required.

(5) Time of spill.

(6) Name, telephone number, and identification of caller.

b. The NOSCDR will immediately notify the NOSC by telephone. The NOSC, in coordination with NOSCDR, will decide what notification and reporting is required. The National Response Center shall be notified (1-800-424-8802) by the NOSCDR if it is determined that the release exceeds the reportable quantity for the spilled substance. A list of reportable quantities for specific substances will be provided by the PWO. As much of the following information as possible will be reported to the NRC.

(1) Location of spill.

(2) Identity of spilled material.

(3) Quantity of spill.

(4) Description of spill - behavior of material, affected areas.

(5) Origin and cause of spill.

(6) Anticipated movement of spill.

(7) Actions initiated or planned.

(8) Types of assistance required.

(9) Time of spill.

(10) Name, telephone number, and identification of caller.

c. Enclosure (1), part B, identifies the Federal, state, and local government agencies that can be notified. The NOSC or NOSCDR will determine which agencies to notify in a given situation. Local governments must be given disaster warnings if the spill poses an immediate threat to human life or property. The NOSC shall determine if such warnings are necessary. These warnings will include:

(1) Identification of the source of threat.

(2) Type of threat expected.

(3) Areas affected.

(4) Time expected.

(5) Expected severity.

(6) Any local action to be taken.

In addition to the above initial notifications, the NOSCDR will periodically notify the previously mentioned agencies of any major developments that occur.

8. Reporting

a. OPREP-3/NAVY BLUE REPORT. Reference (d) specifies that there are situations where the Chief of Naval Operations (CNO) must be immediately notified of a spill. This is done via initial voice report, immediately followed by an OPREP-3 NAVY BLUE Message. Voice report shall not be delayed for determining additional information. An OPREP-3 shall be issued if the spill meets any of the following criteria:

(1) Is a catastrophic event or is subject to ~~a~~ political implications. LOCAL OR REGULATORY

(2) Endangers critical water areas.

(3) Has the potential to generate extremely high interest.

(4) Become the focus of an enforcement action.

(5) Poses a substantial threat to public health or welfare.

b. Initial voice report to CNO shall be made through the Navy Department Duty Captain, Navy Command Support Center, A/V 225-0231, or commercial (202) 695-0231. The voice report shall:

(1) State that the report is OPREP-3/NAVY BLUE, is UNCLASSIFIED and has IMMEDIATE precedence.

(2) Give location (NAS Memphis, Millington, TN), name, type, and amount of HS released, occured (for GMT time, add five hours to CDT, or six hours to CST), and areas affected.

(3) Give name of NOSC, duty telephone number, and assistance required.

(4) State that the NRC will be notified and that record communication will follow.

c. The OPREP-3 NAVY BLUE message Format is included in enclosure (3). The distribution list for the message is given below.

From: NAS MEMPHIS TN

To: CNO WASHINGTON DC
Info: ZEN/CNTECHTRA MILLINGTON TN
CNET PENSACOLA FL
CHINFO WASHINGTON DC
NAVY JAG ALEXANDRIA VA
COMNAVFACENGCOM ALEXANDRIA VA
COMNAVSEASYSCOM WASHINGTON DC
COMSOUTHNAVFACENGCOM CHARLESTON SC
NAVENENVSA PORT HUENEME CA
EPA REGIONAL OFFICE ATLANTA GA
COMDT COGARD WASHINGTON DC

d. HAZARDOUS SUBSTANCE SPILL MESSAGE REPORT. The Hazardous Substance Release (Including Spills) Report must be completed by the PWO and forwarded by message as soon as sufficient information is gathered to complete the report, usually within 24 hours. The message format for this report is included in enclosure (4) and includes the distribution list for the message. For spills determined to be from a non-Navy source, this report is not necessary provided that the initial telephone notification is made. (R

e. FINAL (LESSONS LEARNED) REPORT

Final (or lessons learned) Reports for Navy response to major class oil, PCB, or Hazardous Substance spills shall be submitted by the NOSCDR to CNO, with information to CNET and NOSC (CNTECHTRA) within 60 days of completion of response actions. This report should include full information on the following points:

(1) Cause and initial situation.

(2) Organization of response action/resources committed.

(3) Effectiveness of actions by discharger.

(4) Effectiveness of actions by State and local forces, if any.

(5) Effectiveness of actions by Federal agencies and special forces, if any.

(6) Unique problems encountered.

(7) Recommendations to prevent reoccurrence.

(8) Recommendations to improve response.

(9) Recommended Contingency Plan revisions.

9. Reports. Reports required by this instruction are submitted as OPREP-3/NAVY BLUE REPORT. These reports which contain information "concerning imminent danger to life, health, or property arising from dangerous or defective material" are exempt from reports control.

J. BAKER, JR.

Distribution:
List I, Case I
List II, Case I

Stocked:
NAS Memphis (Code 11120)

EMERGENCY NOTIFICATION LIST

A. NAS Memphis Immediate Notification Sequence:

DEPARTMENT	TELEPHONE NO.	NOTIFY WHEN:
Fire Department	9-911 (24 hrs)	Oil, PCB and Hazardous Substance (HS) spills; Fire or Explosion occurs.
Naval Hospital, Millington	873-5801/5802	Injury/chemical or PCB exposure occurs.
Security	9-911 (24 hrs)	Oil, PCB and HS spills; fire or explosion, injury occurs.
NAS Memphis NOSCDR	873-5500/5509 (24 hrs)	Oil, PCB and HS spills fire, explosion or injury occurs.
Public Works	873-5207/5462	Oil, PCB and HS spills, fire or explosion occurs.

B. Federal, State and local agencies (NOSC or NOSCDR will determine which agencies to notify).

National Response Center	(800) 424-8802	Spill meets/exceeds CERCLA reportable qty.
EPA Response Center (Atlanta, GA)	(404) 347-4062	Major incident.
Tennessee Response Center (Nashville)	(800) 262-3300	Major incident.
Tennessee Dept. of Health and Environment (Memphis)	543-6695	Spill results in chemical exposure.
Millington Water and Sewer Authority	872-1216	Spill enters or threatens to enter sanitary sewer system.
TN Civil Defense (Memphis)	528-2780	Natural disaster occurs.
Southern Division, Naval Facilities Engineering	(803) 743-0583 (AV) 563-0583	Major incident. For technical and environmental assistance.
U.S. Coast Guard (Memphis)	521-3941	Spill enters or threatens to enter waterways.

MATERIALS AND EQUIPMENT LIST FOR SAFE EMERGENCY RESPONSE

MATERIAL/EQUIPMENT	QUANTITY	FUNCTION	COMMENTS
		1. FIRE DEPARTMENT	
Pump Truck	One	Fire Fighting	1-1000 Gal. light water and foam capability.
Emergency Response Vehicle	One	Spill Response	Transport of response equipment and material.
Absorbent Material (Safestep)	100 lbs. (4 25-lbs bags)	Spill Response	Use to solidify and contain spills. Do not use on unneutralized acids or caustics.
Soda Ash/Acid/ Caustic Neutralizer	100 lbs.	Spill Response	To neutralize acids/caustics. Use ph paper for testing.
Shovels	2	Spill Response	Tools for initial containment.
Protective Clothing/Self-Contained Breathing Apparatus	4 sets	Body Protection	Vapors, fumes and chemical protection for body, lungs and eyes.
Absorbent Pads	2 dozen	Spill Response	Use to absorb spilled oil, PCB and HS. Will not absorb water.
First Aid Kit	1 ea	First Aid	Fire-fighting/spill injury.
		2. PUBLIC WORKS DEPARTMENT	
85-Gallon Recovery Drums	4	Cleanup	Use to overpack leaking 55-gal drums.
55-Gallon Recovery Drums (17 H)	15	Cleanup	Use to containerize spill debris and material.
Absorbent Material (Safe step)	500 lbs	Cleanup	Use to pack spilled material.
Clean-up Vehicle	One	Cleanup	Use to transport Equipment and material.
Forklift	One	Cleanup	Use for material, drums and debris handling.
Shovels	4	Cleanup	Tools for moving debris and soil.
Protective Suits	2 dozen	Cleanup	Disposable, impregnated to resist PCB and other chemicals.
Gloves	4	Cleanup	PVC-coated for resistance to PCB, acids & caustics - Do not use rubber gloves.
Full Face Respirators	4	Cleanup	Protect lungs and eyes.
Boots	4	Cleanup	PVC-coated for resistance to PCB, acids and caustics.
Polyethelene	2 dozen	Cleanup	Contain spill.
		3. CBU-404	
Backhoe	One	Cleanup	Use to remove contaminated soil after cleanup.

OPREP-3 NAVY BLUE MESSAGE FORMAT

1. The Message Command Line./ This line consists of:

a. The flagword "OPREP-3 NAVY BLUE."

b. The Unit Identification Code (UIC) of the reporting command.

c. The serial number. Each OPREP-3 incident (regardless of type) is assigned a sequential serial number beginning with the first incident of the calendar year. Following messages concerning the same incident are assigned sequential letters (see paragraph 8 of the basic letter). The sample command line below is the third message concerning the ninth OPREP-3 incident reported by the unit during this calendar year.

Sample message command line:

a b c
OPREP-3 NAVY BLUE/N01893/0098

2. Message Text. The text of OPREP-3 NAVY BLUE reports will be arranged in paragraphs as shown below. Use UNKNOWN, NONE or other appropriate language for paragraphs for which the data is not known, or not relevant to the reported incident.

1. INCIDENT
2. CDR's ESTIMATE
3. REFERENCE
4. DETAILS
   A. TIME
   B. LOCATION
   C. NARRATIVE
5. LOSS/DAMAGE
6. REMARKS

a. INCIDENT. Provide a brief phrase or sentence description of the type of incident. In cases of misconduct by Navy personnel include the name and rank of the alleged offenders. All OPREP-3 NAVY BLUE messages will include this paragraph.

b. CDR'S ESTIMATE. The commanding officer's estimate of the situation, the impact of the incident on his unit, and the ability of the unit to operate.

c. REFERENCE. The Date-Time-Group (DTG) in Greenwich Mean Time (Zulu) of the preceding voice or message report. The reference DTG is not the same as the incident DTG which is reported separately. Indicate the recipient of a voice report.

d. DETAILS. Initial message reports will include all three subparagraphs, whereas follow-up messages need only submit LOCATION and any supplementary narrative detail. Additional subparagraphs may be used as appropriate.

(1) TIME. The time or approximate time of the incident in Greenwich Mean Time (Zulu) only. Do not use the DTG of the message or of a previous report of the incident.

(2) LOCATION. The location where the incident took place in latitude/longitude, GEOREF coordinates or place name.

(3) NARRATIVE. Provide a description of the incident including all known significant details and actions taken by the unit in response to the incident. Include the cause of the incident and the results of any investigation or disciplinary action if known and if appropriate.

e. LOSS/DAMAGE. Provide an account of the personnel or equipment losses or damages incurred as a result of the incident. Unknowns will also be reported. When reporting LOSS/DAMAGE resulting from an aircraft accident, use the damage and injury codes defined in OPNAVINST 3750.6M. When reporting the death or serious injury of U.S. military personnel, names will be withheld pending notification of next of kin unless positive identification is deemed necessary. In such cases, the names can be listed provided the following statement is included: "FOR OFFICIAL USE ONLY. NEXT OF KIN HAVE NOT YET BEEN NOTIFIED."

f. REMARKS. Include any comments that would enhance the value of the report but which do not properly belong in any of the other paragraphs. Include any press interest or releases generated from the incident, if appropriate, and the status of NIS notification/participation when an incident results in NIS involvement. Also include the reason for any delay between the incident time and the initial voice or message report which exceeds the time frame provided in this instruction. ANY DELAY IN THE INITIAL REPORT IN ORDER TO OBTAIN ADDITIONAL INFORMATION IS UNACCEPTABLE. OPREP-3 reports of aircraft accidents will include the following in the remarks paragraph:

(1) Aircraft model, BUNO, reporting custodian and custodian location.

(2) Pilot's name, rank, injury code, and the number of other persons on board and their injuries.

(3) Mission and phase of operations (e.g., taxi, takeoff, inflight, approach, landing, etc.)

ALL OPREP-3 NAVY BLUE reports will end with one of the following two phrases, "AMPLIFYING INFO TO FOLLOW" or "LAST OPREP-3 REPORT THIS INCIDENT."

HAZARDOUS SUBSTANCE RELEASE (INCLUDING SPILLS) MESSAGE FORMAT

Precedence: HS release messages will normally be by routine precedence provided prior telephone report has been made; if not, use priority precedence.

Classification: HS release reports are unclassified, unless necessary to prevent disclosure of classified information.

Message Addressee and Info Blocks for HS releases in the United States and its contiguous zone

From: Navy Activity/Ship (HS releaser)

To: COMDT COGARD WASHINGTON DC

Navy Command (predesignated NOSC)

Info: CNO WASHINGTON DC

COMNAVFACENGCOM ALEXANDRIA VA

COMNAVSEASYSCOM WASHINGTON DC

EPA Regional Office

NAVENENVSA PORT HUENEME CA

COMNAVFACENGCOM (EPD)

- - - - - - -

Message Addressee and Info Blocks for HS releases in foreign countries and international waters

From Navy Activity/Ship (HS releaser)

To: Navy Command (predesignated NCSC)

Info: NAVENENVSA PORT HUENEME CA

CNO WASHINGTON DC

Subj: Hazardous Substances Release Report (Report Symbol OPNAV 5090-3) (MIN:CONSIDERED)

1. CNO for Op-45, COMNAVFACENGCOM for 112.

2. GMT DTG release occurred/discovered.

3. Activity/ship originating release:

(1) For ships: List name, hull number.

(2) For shore activities: List name & UIC.

(3) For Navy releases that occurred during transportation, list name of activity responsible for shipment.

(4) For non-Navy releases, list name of responsible party. (If from commercial firm under contract to Navy, list name of firms & contracting activity.)

(5) For unknown source releases, indicate whether release is thought to have originated from Navy operations.

4. Release location:

(1) For releases at sea, specify latitude, longitude, and distance to nearest land.

(2) For releases in port, list port name, and exact location (pier, warehouse, etc.).

(3) For releases ashore:

(a) Within activity, specify exact location (building or area designation, etc.).

(b) During transportation, give exact location (highway or street name, number, city, or miles from nearest city).

5. Type of operation at source. (Plating shop, painting shop, hazardous waste facility, truck, ship, pipeline, ship rebuilding, entomology shop, etc.) Be specific.

6. Type of container from which substance(s) escaped (55 gal drums, 5 lbs bags, tank truck, storage tank, can, etc.) Estimate number of containers damaged or dangerously exposed.

7. Description of hazardous substance(s) released. (Consider container labels and user directions, hazardous materials reference books, personal knowledge, expert's advice, etc.) Be concise but complete.

If substance(s) known, give chemical and/or product names, formula, synonym(s) (if known), physical and chemical characteristics, and inherent hazards.

Example: Label on container identifies substance released as acrylonitrile. Synonyms: cyanoethylene, vinylcyanide. Characteristics and hazards: poisonous liquid and vapor, skin irritant; highly reactive and flammable.

OR

If substance(s) unknown, describe appearance, physical and chemical characteristics, and the actual and potential hazards observed.

Example: Substance releases is a colorless to light yellow unidentified liquid; highly irritant to eyes and nose; smells like kernels of peach pits. Is vaporizing quickly posing ignition problem.

8. Field testings. (If none, so state.) Indicate findings and conclusions (i.e., concentrations of substance(s) present, pH, etc. of any analyses.

9. Estimated amount released. Use convenient units of weight or volume (kg, lbs, gallons, liters, etc.) For continuous release, estimate rate of release and amount left in container.

10. Cause of release. Describe the specific cause of release; account for any personnel error, equipment failure, accident, or act of God, directly contributing to the release.

Example: Railing supporting 55 gal drums on a flatbed truck gave way because it was not securely fastened, causing 7 drums to fall and fracture.

11. Release scene description. Describe scene of release. Include information about the physical characteristics, size and complexity of release, the actual and potential danger or damage to the immediate area and the surrounding environment, including weather conditions if relevant.

Example: Solvent released formed shallow pond covering area about 30 ft by 45 ft of bare soil. Solvent is slowly running off into floor drain leading to storm drain and is also infiltrating soil. Pond is emitting highly toxic and flammable vapors. Dark clouds threatening to rain. Wind speed about 10 miles/hr., drifting vapors northbound to residential area. Vapors form layer about 30 ft just above ground.

12. Notifications made and assistance requested:

(1) List all organizations informed of the release in and out of Navy jurisdiction. Include Navy and Federal, state, and local authorities, NRC response teams, fire departments, hospitals, etc.

(2) Specify kind of assistance required from these organizations.

13. Describe control and containment actions taken/planned. (If none, state why.) Specify methods used to control and contain release. Indicate parties carrying out response.

Examole: Gas barriers used to control vapor emissions. Runoff contained by excavating ditch circumscribing affected area. In-house personnel and members of city of Portstown fire department carried out containment actions.

14. Describe cleanup actions taken/planned. (If none, state why.) Indicate whether cleanup is made by on-site or off-site treatment, the method used, and parties involved in cleanup/removal.

Eventual disposal area

Example: No cleanup action taken. Toxic vapors present, potential danger to cleanup crew. Contaminated soil will be excavated and shipped by on-base personnel to class I HW disposal site in Portstown, CA when conditions allow.

15. Contact for additional information (name, code, autovon and/or commercial number).

16. Additional comments.

APPENDIX G

DIRECTIONS TO EMERGENCY MEDICAL FACILITIES

DIRECTIONS TO THE NEAREST MEDICAL FACILITIES

HOSPITAL

METHODIST NORTH HOSPITAL
3960 COVINGTON PIKE
MEMPHIS,TENNESSEE
EMERGENCY NUMBER: (901)372-5211

Directions to Methodist North Hospital from NAS Memphis Naval Hospital:

(1) From the hospital drive west on Navy Road to 7th St.

(2) Turn left on 7th and proceed to the South Gate.

(3) Exit site through the South Gate (Singleton Parkway).

(4) Continue on Singleton Parkway through the stop signs.

(5) Singleton Parkway and Covington Pike will intersect at a red light (about 5 miles).

(6) You will see the entrance to the emergency room about 700 feet past this light on the left.

APPENDIX H

HEALTH AND SAFETY PLAN FORMS

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project work site and returned to, EnSafe/Allen & Hoshall, Memphis, Tennessee.

Job No: 2151-040

Contract No: N62467-89-D-0318

Project: LEAKING PETROLEUM STORAGE TANK FIELD INVESTIGATION

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____

Signed

_____

Print Name

_____

Company

_____

Date

EMPLOYEE EXPOSURE HISTORY FORM

EMPLOYEE: _____

JOB NAME: _____

DATE(S) FROM/TO: _____

HOURS ON SITE: _____

CONTAMINANTS (SUSPECTED/REPORTED):

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

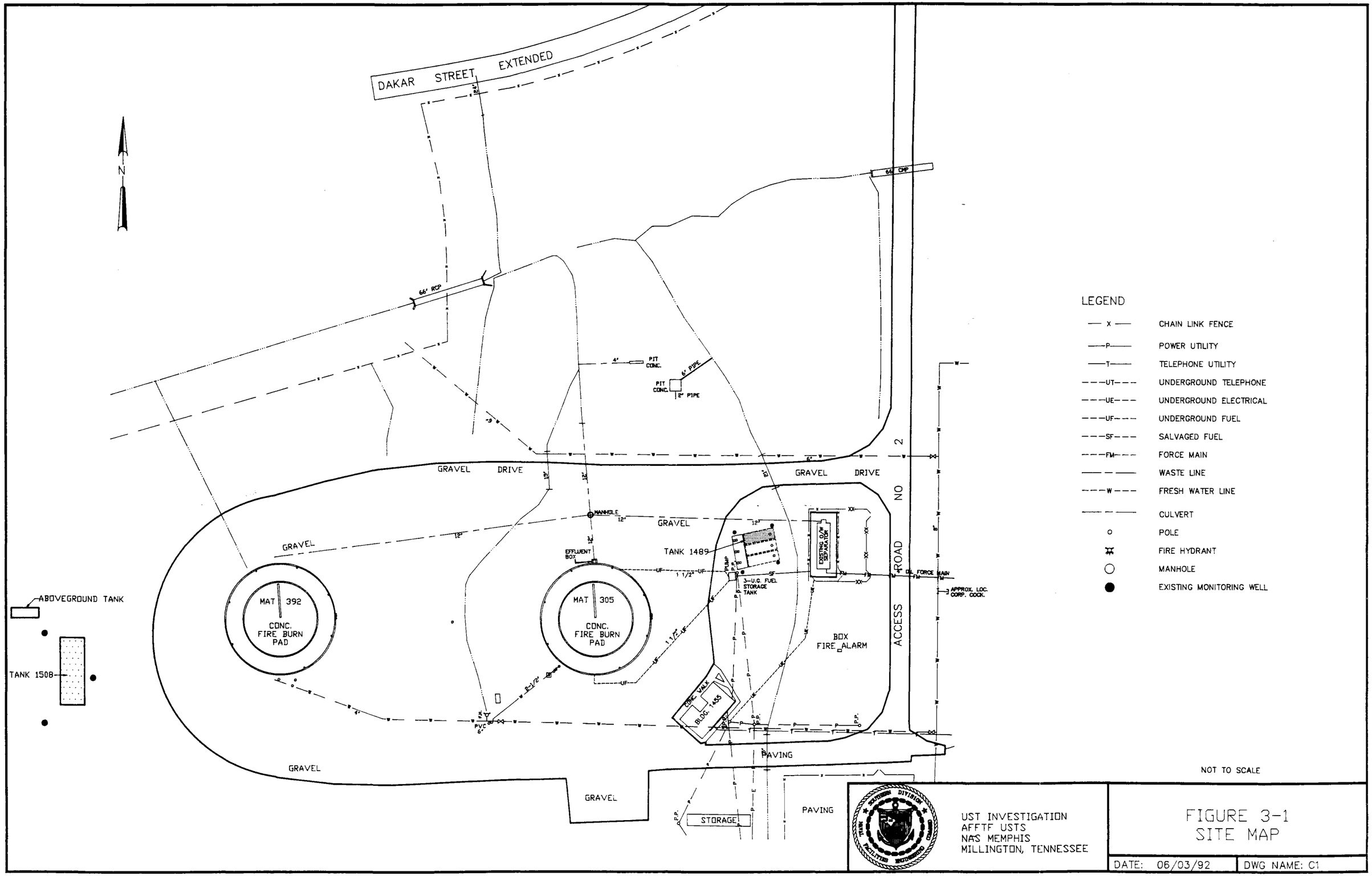
(SEE ATTACHED LABORATORY ANALYSIS)

PLAN FEEDBACK FORM

Problems with plan requirements

Unexpected situations encountered:

Recommendations for revisions:



NOT TO SCALE

UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 3-1
SITE MAP

DATE: 06/03/92 | DWG NAME: C1

00463666 B32

DAKAR STREET EXTENDED

N

66" RCP

66" CMP

4" PIT CONC.

6" PIPE

PIT CONC.

2" PIPE

GRAVEL DRIVE

EXCLUSION ZONE

GRAVEL DRIVE

MANHOLE

GRAVEL

EFFLUENT BOX

TANK 1489

EXISTING O/W SEPARATOR

3-U.G. FUEL STORAGE TANK

MAT 392 CONC. FIRE BURN PAD

MAT 305 CONC. FIRE BURN PAD

CONTAMINATION REDUCTION ZONE

SUPPORT ZONE

ACCESS ROAD NO 2

ABOVEGROUND TANK EXCLUSION ZONE

TANK 1508

CONTAMINATION REDUCTION ZONE

SUPPORT ZONE

CONC. WALK

BLDG. 1455

PAVING

GRAVEL

GRAVEL

STORAGE

PAVING

LEGEND

EXISTING	DESCRIPTION
—— x ——	CHAIN LINK FENCE
—— – ——	WASTE LINE
—— – ——	CULVERT
o	POLE
	FIRE HYDRANT
○	MANHOLE
●	EXISTING MONITORING WELL
	EXCLUSION ZONE
	CONTAMINATION REDUCTION ZONE
	SUPPORT ZONE

NOT TO SCALE

SOURCE OF BASE DRAWING:

UST INVESTIGATION
AFFTF USTS
NAS MEMPHIS
MILLINGTON, TENNESSEE

FIGURE 3-2
WORK ZONES

DATE: 06/03/92

DWG NAME: C1